THIS EDITION 6,000

COTTON

APRIL, 1911.

COMBINED

Oil Separating

AND

Waste Washing

MACHINE

SPECIFICATIONS

Basket	20 in. diameter
Capacity	2 cu. ft.
Rev. per min.	1800 to 2000
Steam pressure required	80 to 100 lbs.
Exhaust outlet	2½ in.
Steam supply pipe	½ in.
Water supply pipe	½ in.
Water pipe outlet	1¼ in.
Oil pipe outlet	1¼ in.
Base measurem't	28½ in.
Height	6 ft. 0 in.
Weight	500 lbs.

MANUFACTURED BY

AMERICAN TOOL & MACHINE COMPANY

109 BEACH STREET

BOSTON

ENGINEERS

FOUNDERS

MACHINISTS

ALSO MANUFACTURERS OF

WESTON

Hydro-Extractors

Belt Driven
Patent Direct Connected
Electrically Driven

POWER TRANSMISSION MACHINERY

CENTRIFUGAL OIL SEPARATORS

BRASS FINISHERS, LATHES, CHUCKS, SLIDE RESTS, ETC.

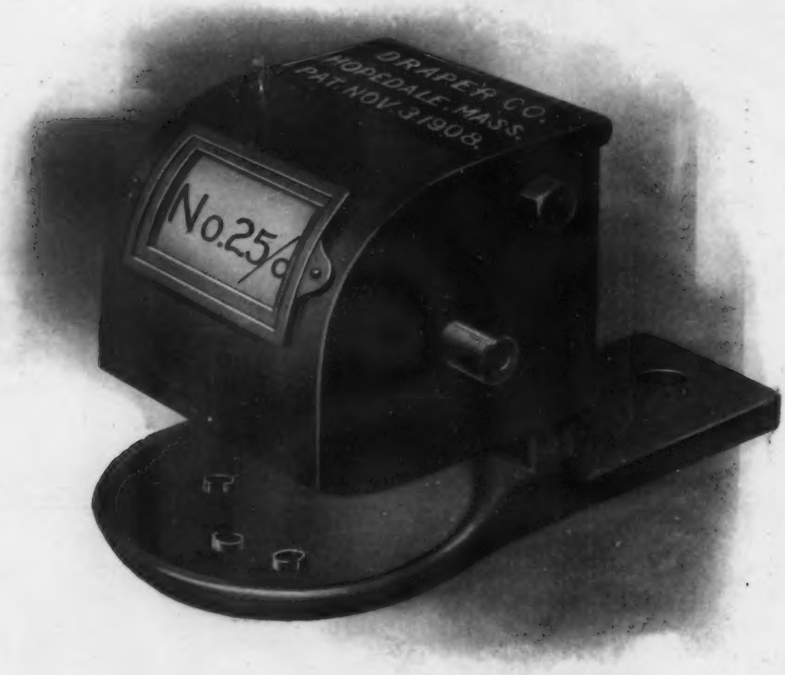
SPREADING MACHINES

DOUBLERS

ESTABLISHED 1830

If your fingers are all thumbs,

why try to sort your travelers by hand?



Let Duckworth's Traveler Magazine do the work.

OVER 5,000 IN PRACTICAL USE.

DRAPER COMPANY, HOPEDALE, MASS.

J. D. CLOUDMAN, Southern Agent, 40 S. Forsyth St., Atlanta, Ga.

COTTON

with which is combined

BOSTON JOURNAL OF COMMERCE AND TEXTILE INDUSTRIES and SOUTHERN MILLS.

Vol. 75, No. 6. ATLANTA, GA., APRIL, 1911.

PUBLISHED MONTHLY BY

COTTON PUBLISHING COMPANY

ATLANTA, GEORGIA, U. S. A.

CHICAGO, NEW YORK, BOSTON, TORONTO, CANADA PHILADELPHIA, CLEVELAND, O.

L. L. ARNOLD, Editor.

W. IRVING BULLARD
H. H. KELLEY
F. C. MYERS
D. H. BRAYMER
} Associate Editors.

CONTRIBUTING EDITORS

J. Merritt Matthews, Alfred Burton, Charles E. Barnhardt, H. R. Carter, Stewart F. Carter, Frederic Dannerth, D. E. Earle, Jos. H. Hart, Sanderson W. Hayes, F. W. Horrocks, O. F. Ireland, Emil Kahn, Thomas Nelson, Will Nelson, Frank Nasmith, David Paterson, Henry Rowe, Wm. Scott Taggart, C. O. Terwilliger, John F. Timmerman, Ernest Tompkins, Samuel Ward, William Watson, and F. R. Weller.

SUBSCRIPTION RATES.

Domestic ..... Fifty Cents Per Year
Canada ..... $1.00 Per Year
Foreign ..... $2.00 Per Year

Complaints of failure to receive Cotton regularly or of errors of any nature relating to subscriptions should be promptly made to the publication office in Atlanta.

Orders for any change in advertisements must reach Atlanta previous to the 15th of the month preceding month of issue, otherwise publishers cannot be responsible for changes.

Entered at Atlanta Postoffice as Second-class Matter.

CONTENTS.

EDITORIAL.
- A Permanent Tariff Commission 203
- What the Tariff Revision Interests Really Are 204

GENERAL.
- A Typical Southern Knitting Mill 205
- A Reinforced Concrete Cotton Mill 210
- The South's Textile Opportunities 211
- Immigration and the South 212
- Eighth International Cotton Congress 213
- Obituary on the late Hon. Thomas Adamson 214
- The Cause of Poor Trade Conditions 215
- Obituary on the late Haven C. Perham 215

MILL CONDITIONS AND MARKET REVIEWS.
- Southern Mill Situation 216
- New England Mill Situation 217
- The Yarn Market 218
- Monthly Review of the Cotton Market 219
- The Knit Goods Market 219

COTTON MANUFACTURING.
- Cotton Mill Machinery Calculations 220
- The Preliminary Processes of Cotton Manufacturing 223
- Setting the Harness 225

KNITTING.
- Knitting Yarns 226
- The Manufacture of Full-Fashioned Sweaters 229

DYEING, BLEACHING AND FINISHING.
- Harmony and Contrast of Color 231
- Tetra Chloride of Carbon 234
- English Dyers Wage Agreement 234

PRACTICAL PROBLEMS DISCUSSED BY COTTON'S READERS 235

NEW MACHINERY AND TRADE NOTES 238

A PERMANENT TARIFF COMMISSION.

While it is almost certain that the special session of Congress will be used as a vehicle to open up the subject of tariff revision, it is to be devoutly hoped that the present action will be confined to the appointment of an independent permanent tariff commission, whose duty it shall be to take up the schedules listed for revision and give each and every one of them a fair and honest examination and at the same time allow those interested, or their representatives, an opportunity to present their side of the case, if it seems to them desirable to do so.

It would be far wiser for the Democratic majority in the House to confine its efforts to some such preparatory measures that would probably receive the support of the majority of the Senate and the sanction of the President. A party demonstration at this time would inevitably result in a fruitless tariff agitation throughout the whole summer.

This is particularly undesirable in view of the fact that ever since the tariff legislation of 1909, the rumor maker has had a busy time prognosticating further tariff revision, denouncing the present tariff law and creating general business and political unrest. The very natural result has been seen in the deflated market conditions, the unusual stagnation of business and the remarkable hesitancy of capital to embark in new channels. It is only fair to the manufacturer and his employees, that any legislation affecting textiles during the session should be of such a nature as to convince invested capital of its ultimate fairness and that revision, if found necessary, will be gradual and suited to meet the business conditions obtaining among plants that will be actually affected by the changes decided upon.

The mere fact that the experts employed by the present tariff board have their reports on textiles nearly completed, should not be urged as an excuse for making any hasty moves that can accomplish nothing at this session but prolonged argument in Congress and further business depression throughout the whole country. The mere suggestion that such agitation may take place has already shown itself in a very perceptible tightening in the money markets of the leading textile centers.

Public opinion has seldom expressed so much interest in a single question before Congress as it is showing in this question of creating a permanent tariff commission. This commission would control one of the most vital functions of the Government and one that should be kept free from "politico-legislative" interference. The business interests of the country and the people of all sections and of all political faiths, desire and demand an immediate action on this important question and no more time should be lost in obstructive parliamentary tactics. This question is now "square up" to each individual member of the sixty-second Congress and no one of them should fail to heed the hand writing on the wall, or forget for an instant that dras-

tic tariff legislation at this time from any cause, or for any reason whatever, from pleasing political prophets to keeping party promises would not only be an unfortunate error, but a suicidal policy.

WHAT THE TARIFF REVISION INTERESTS REALLY ARE.

There is a plan now being prepared, in which a considerable number of operators of textile mills are interested, to bring together a majority of the domestic textile manufacturers for the purpose of carrying on a campaign of education among the people as to the tariff, and its relation to makers of all kinds of textile products. The main reason for this organization is because mill agents at the larger ports of the North Atlantic States are informed upon unimpeachable authority that there is being developed a well planned and richly endowed campaign for bringing about large reductions in the imposts upon nearly all products of textile mills.

Among the operators of textile mills in the Middle and Eastern States best informed upon tariff matters, the opinion is unanimous that despite the protestations of political workers who specialize on the tariff, that the extraordinary session of 1911 will deal only with the matter of Reciprocity with Canada, the revision of the tariff will be taken up and will be the occasion of long debates that will probably carry the session into September. There is now in operation a large publicity bureau, that is known to be subsidized by foreign capital and from which every day goes forth matter for the daily and weekly newspapers and periodicals, designed to make it appear that exorbitant profits are made by our textile producing interests, and that drastic reductions in the imposts would be such a great boon to the people as to reduce the cost of their clothing at least one fourth.

Even some of the so-called "funny" weeklies have been richly subsidized by the tariff revision interests that are on the skirmishing line, just as the Congress is to be called into session. A few days ago the president of a number of important Southern and Eastern textile mills was lampooned in one of these "funny" weeklies. The article tried to make it appear that the capital in the mills that he heads is nearly all owned by himself, and the intimation was that he had made most of the money through special tariff ratings procured by himself. The fact is, that almost 15,000 shareholders own those mills, and that this President has made a point at all times to keep away from Washington before and during changes in the tariff, and has looked upon tariff tinkering as a condition to be faced by textile mill operators in the spirit that high prices for cotton and strikes are confronted—that is, to adopt the best possible way for bridging over the difficulties.

As the textile industry has been since 1850 first in the rank of our manufacturing industries, it is always in a position to invite the attacks of the powerful confederated interests that would like to see absolute free trade in all textile products. The statistical position of the interests desiring to effect large reductions in the imposts on textile products is very much stronger than ever before. The most powerful of the syndicates of European bankers have bought enormously in all our trunk railroads; have bound those railroads into communities of interest with European steamship lines plying to our ports; and into long term traffic contracts with private and government owned European railways. Hence, for a long time, it has been possible for many European manufacturers to obtain rates from Germany, France and Great Britain to most parts of our West and South, which make the whole freight from the producing mill to the place of final sale, much below the average freight rates to the same consumers from our tide water points.

The shipping agents of the principal dry goods commission houses at New York, Philadelphia and Boston have collected evidence upon this subject that gives a ready answer to those who ask why it is that such enormous quantities of imported textile products are on sale everywhere in a country in which, but a few years ago, only 11 per cent. of the textile goods consumed came from abroad. The aggregate capital of all the textile mills abroad and of the foreign railways, steamship lines and other interests allied therewith, that wish to bring about the "Open Door" for European goods in this country, is estimated at seventy-nine times the aggregate capital of all the textile plants and kindred industries in our country.

Foreign steamship and railway companies expend in our country in advertising in daily and weekly newspapers and periodicals about $5,000,000 a year. Is it any wonder that the cleverly written matter in favor of tariff reductions, that is handed out to the press by the same agencies that place this $5,000,000 worth of tourist travel matter every year, gets into thousands of our domestic publications, and is taken for gospel truth by many of our people, and not for what it is—advertising matter for booming the freight business of foreign railways and steamships, bound into the strongest community of interest in the world, by the work of these syndicates of foreign bankers, who year by year greatly add to their holdings of American railroads, coastwise, lake and river steam vessels, and who are constantly increasing their power to mould our national legislation for their pecuniary advantage.

It is because of these matters of vital import to our textile industries, that there is shaping forth what will be ere long a powerful organization to promote the greatest good of the greatest number of stockholders in domestic textile mills and allied interests. This body should carry on a campaign of popular education on the tariff question, that will be an eye opener for the whole people.

Massachusetts exceeds every other state in the number of cotton spindles, having 9,835,610, or 34 per cent. of the total for the country. South Carolina ranks second, with 3,793,387, or 13 per cent. and North Carolina third, with 3,124,456, or 11 per cent. Rhode Island has fourth place, Georgia fifth, New Hampshire sixth, Connecticut seventh, New York eighth, and Maine ninth. No other state reports as many as a million spindles.

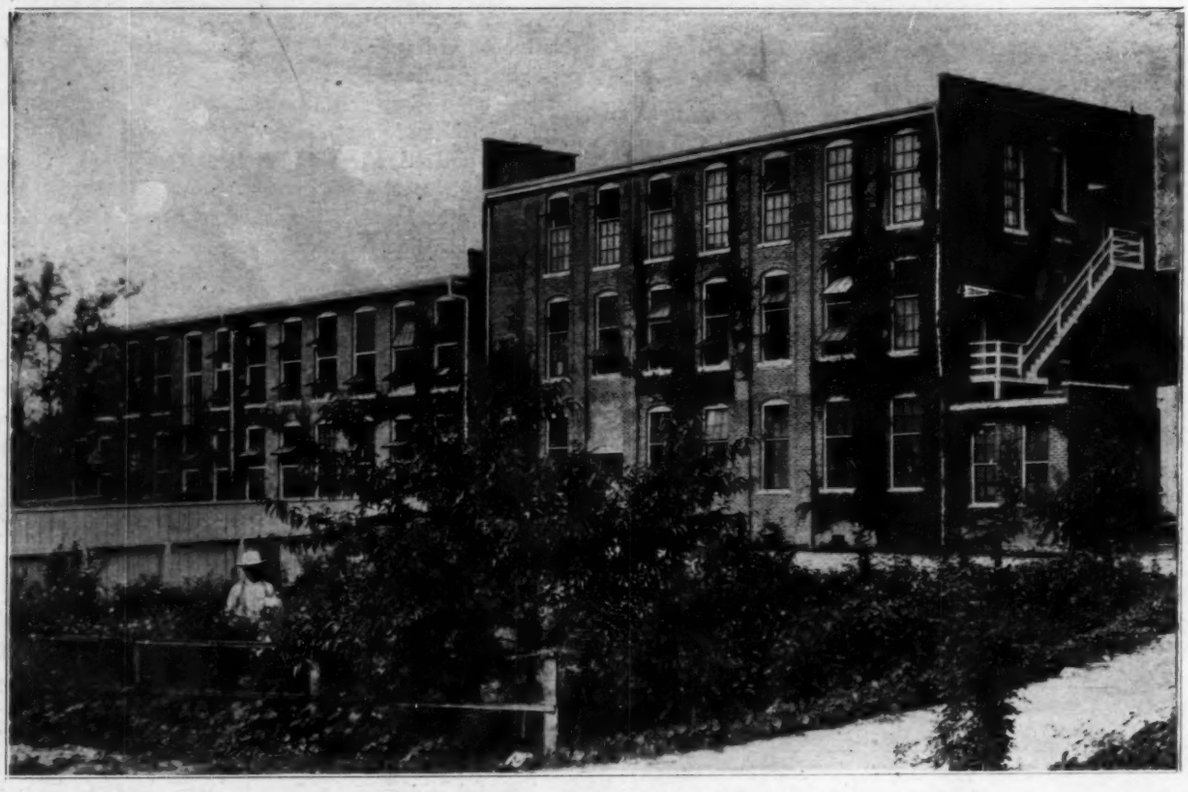
Cotton, although the United States produces practically three-fourths of the world's supply, shows importations in 1900 of 60 million pounds valued at eight million dollars; and in 1910, 85 million pounds valued at 17½ million dollars.

The value of cotton exported in 1900 was 314 million dollars, and in 1910, 531 million.

A TYPICAL SOUTHERN KNITTING MILL

A Successful Southern Enterprise With a National Reputation—The Result of Modern Ideas, Modern Machinery and a Twentieth Century Man.

The plant of the Richmond Hosiery Mills is located in Rossville, Ga., a suburb of Chattanooga, Tenn., within the shadow of historic Lookout Mountain and almost at the entrance to the beautiful and famous Chickamauga Park. The natural environment is ideally Southern and picturesque, and every effort has been made to beautify the mill buildings and to make the surroundings as inviting as possible. The first impression, therefore, that the visitor has on approaching the mills, is of the massive red brick buildings practically covered by the green luxuriance of the clinging vines which frame the myriad windows of the mill buildings, and convert the prosaic outlines of the huge manufacturing plant into a thing of actual beauty in the landscape.



One of the Mill Buildings of the Richmond Hosiery Mills, Rossville, Ga., and a Flower Garden.

But neither beauty of exterior nor size of buildings are always reliable evidences of commercial supremacy, for actual figures mean much more, so that the real importance of the Richmond Mills is best shown by a few quotations from the company's records, and these figures gather even added significance when they are applied to the human element reached by the Mill, as well as to the machines and general output. It will, therefore, be of interest to note that there are 750 persons employed by the company—almost a settlement in itself and really the main reason for the existence of the town of Rossville. There are 5,000 spindles for producing hosiery yarns, the product being used in their knitting departments. There are 100,000 dozen pairs of hose constantly on hand in the company's stock room, while 6,000 boxes are made each day to accommodate this supply and those sent out to dealers. About 5,000 pounds of goods are dyed black daily, besides a quantity of other colors. The annual business of this mill is averaged at about $1,000,000, while of this amount some $250,000 is paid in salaries to employees.

These facts and figures tell a story in themselves, but it is a story so interwoven with a genuine, wholesome philosophy of industry, as it were, that it is well worth telling in its every detail, for an enterprise of this kind is undoubtedly an evolution, as gradual as it is great, and one which is only made possible by the most minute attention to each individual part of the massive whole. To gain some idea of the splendid work of the Richmond Mills, therefore, it is well worth while to take a comprehensive view of the work of the entire plant.

Much of the cotton used in this mill is grown on mill property. The processes for spinning the yarns for hosiery work are identical with those of other cotton mills. The cotton is opened up and distributed by the most modern methods, the waste and dust being afterwards utilized as fertilizer for the very lovely gardens which surround the mill. Just outside of the big bright room where the cotton is opened and distributed, there is a huge reservoir holding some 135,000 gallons of water, which is supplied from McFarland Spring in the near-by mountains, but which

has also been recently equipped with attachments to the city water supply. This resevoir, as well as another one, holding some 65,000 gallons, subserves several valuable purposes in the mill. From this source water is supplied to the numerous humidifiers which are so essential to the proper handling of the cotton, the proper degree of atmospheric moisture being an integral part of the successful production of hosiery. This fact has been amply demonstrated by the Richmond Mills, and Mr. Shepherd, the superintendent, who was for many years employed in the world-famous mills of Nottingham, England, where climatic conditions are so nearly ideal for hosiery manufacturing, declares that the modern humidifier so closely approaches the natural moisture in the English atmosphere as to create similar knitting conditions here. That the durability of the finished hose, its elasticity and general usefulness is largely influenced by the moisture which surrounds the knitting process of the yarn has been proven by experience.

SANITARY CONSIDERATIONS FOR EMPLOYEES.

But the water supply throughout the plant is so utilized as to form a most perfect safeguard in case of fire. There is a perfect system of pumps and fire pipes, and a fire drill for employees as minute in its every detail as any used in the most modern educational institutions or other large enterprises where hundreds of people are at work. There has never been a general fire in the Richmond Mills, but the bells are often rung, the equipment taken out and tried, and the buildings emptied of employees, just to insure the perfect working of fire drill, should the need arise. This one element of consideration for employees may be said to mark the key-note to the success of these mills, for as perfect as a mechanical equipment may be, as carefully as every physical detail may be watched, yet after all, when mill work is resolved down to its last analysis it is the human element which counts for final perfection of work; and this human element is given every consideration in this modern mill. The big rooms, with the perfect ventilation, light and cleanliness are all evidences of this care which constantly surrounds the worker.

In the carding room the machines are situated with the view to the best comfort of the operatives. In the spinning department there are only 39 operatives, but so perfect is the distribution of the work and so many and varied are the labor saving devices that these workers accomplish their daily tasks with marvelous ease and rapidity. In this room there are women and young girls, all looking to be in good physical health, and each one seemingly interested in her task. As the bright hunlight filters through the windows, glistening here and there on the green leaves of a window garden or glancing along the shining machines, there is very little resemblance to the hideous pictures so often drawn of the relentless and life-destroying ogre of the modern cotton mill.

In the knitting room, again, the conditions as seen in the spinning room are repeated, only here the number of operatives are increased; the long rows of the machines each demanding individual attention, while up and down the aisles walks the teacher or director, showing each new comer with infinite pains and patience. This position of teacher is one to which each worker may aspire, for a teacher is always taken from the ranks, and is selected as the most efficient worker. Unlike the other operatives, the teacher is paid a stated salary independent of the amount of work accomplished. The question of paying by piece work has been given most careful consideration in this mill. The mill was founded in 1896, and for several years all workers were paid stipulated salaries according to the various grades of work. After a few years, however, this method was found unsatisfactory, and it was announced that work was to be paid for according to amount done. At first there was general dissatisfaction, but the superintendent encouraged the workers by assuring them that if an individual should fall short of the salary earned it would be made up to him. He knew, from the experience of other mills here and in England that this would not be necessary, and the very first week showed it conclusively to the operatives themselves. The experienced workers made considerably more than the salary rate, even the novices totaling fully as much as their former salaries with the added incentive of working for more. This plan of payment by output is one that seems to insure a marked *esprit de corps* among the workers as well as encouraging a certain ambitious and persistent effort which is of manifest benefit to the work as well as to the worker.

ADVANCEMENT OF THE INDIVIDUAL.

This question of earnings by the individual worker is closely coupled with another principle of this mill which is slightly different from that practiced in many other industrial enterprises. It has long been recognized by the employees of a big manufacturing plant of any kind that acquiring perfection in any one line of work does not mean advancement, save, perhaps, in a slight increase in earnings. In other words if a spinner becomes particularly expert in her line she is not at all certain that she will not be retained always in that one room, because she becomes more and more a valuable part of the machine which she assists. This principle, however, is not followed in the Richmond Mills. If an operative in any one line becomes expert in that line and then believes he or she can do some other work equally as well and which perhaps pays better, if application is made for a change of work it is invariably given. With this opportunity it is possible for any employee of the Richmond Mills to become familiar with every branch of the work, personal fitness alone being a prerequisite for advancement and success.

It is a fact, however, that the human organism is not dissimilar to a machine in some ways, for often minds and muscles trained to one line of work are difficult of adjustment to any other. This was illustrated recently in the Richmond Mills in the case of one of the stocking turners. These turners are all boys, usually small boys, and each one sits before an iron figure of a foot and leg which is inverted and over which the newly knit hose is turned. In watching these boys work the eye is at once attracted to the central figure of a boy about 18 or possibly a little less, who turns the hose with lightning rapidity and machine-like regularity. One would think he had become too expert in this work to be kept at it to the exclusion of all else, but as a matter of fact he has been tried at several other positions requiring brain as well as brawn, and has made signal failures, so he seems surely attached to the iron figure in front of his bench, although, be it noted that he daily and hourly increases his output and hence his weekly stipend, even though he is never moved upward or onward.

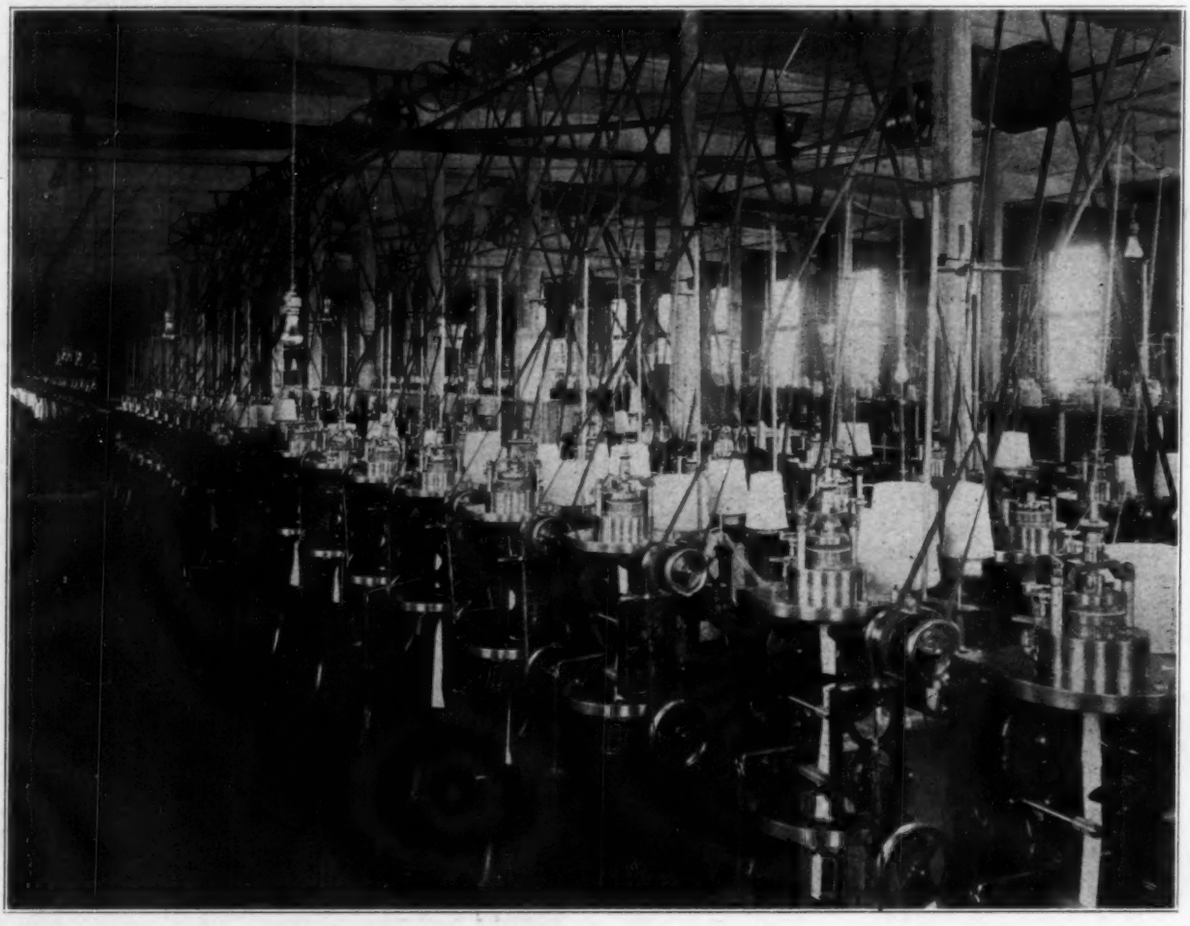
SOME SECRETS OF SUCCESS.

This careful watching of the individual possibilities is

but one of the secrets which have led to the success of this enterprise, for it is only through years of experience and intelligent weighing and testing of conditions that the present methods employed have become fixed rules. One of these rules is shown in the minute care which is given to every separate piece of work done in the mill. This does not mean to every dozen pairs of hose manufactured nor even to every pair, but to every single one of a pair which goes through the myriad processes before it is finally considered marketable.

The knitting, the transferring of the tops of half hose the turnings and looping of toes, the dyeing, pressing, labeling and inspecting go on with most minute attention to details, so small that they would be overlooked entirely by the eye of the ordinary observer. A corps of women and girls examine the stockings for tiniest flaws; and another division of the corps correct these flaws with needle and thread, if possible, or consign the articles either to the lot of "seconds" or discard them altogether. Of those discarded many are unwoven and the yarn used again, this principle of saving making it possible to discard many articles which a false principle of economy might otherwise send to the sales room. It is this careful inspection and this method of discarding defective hose which makes it possible for this company to put out on the market the guaranteed brand which is so winning the favor of the public.

The dye used in all the brands of hosiery put out by this mill is especially fitted for the purpose; it is prepared in the plant itself by the most sanitary methods and it does not injure or weaken the fabric. There are three different kinds of black dye, some 5,000 pounds of goods being dyed daily, independent of the other colors. The dye house in itself is an interesting part of the plant, but its capacity is insufficient at present, and a new building for dyeing purposes is being planned. In dyes, the popular colors of the day are carefully matched and the beautiful wine colors, royal purples and even the more delicate shades for women and children's hose are used daily. At this time there are also many pure white hose being manufactured for all classes of patrons as fashion has decreed that the white hose, and also the white half hose will be used during the coming spring and summer.



View Showing the Knitting Machines Which Make the Hose, and the Lower Part of the Half-Hose.

Next to the minute inspection and individual care given to each separate article manufactured, there is another principle in operation in these mills, and this is the practice of manufacturing as far as possible, within the plant itself everything that is needed for hosiery, when it goes from the manufacturer to the dealer. With this end in view there is, in addition to the regular manufacturing processes the added industry of a paper box factory. The paper itself is bought from a paper mill, but the processes of making the boxes, cutting, covering, labeling, etc., are all done in the mill, with the result that while the box factory was originally designed to handle only about 3,000 boxes a day, that amount has been doubled because of the expert work done, and even this number is now found inadequate for the company's needs, and a larger box factory is contemplated.

Like the dye house, the box factory is almost an individual industry and furnishes a most interesting sight for the visitor. There are many different styles and qualities of hose packed into these boxes, and they range in quality from the pure silk half hose, recently added, to the child's stocking designed for rough wear. Of this latter class the Richmond Mills has the distinction of being among the first, if not the first, to guarantee a boy's stocking. There are also several brands of girls' stockings made here, and also many brands for women. The different styles of men's half hose are well known, under different trade

Garnett Andrews.

names. Most of these styles are differently priced, as are the tiny infants' stockings which are made in black and all the dainty colors suitable for the baby. The advantage of the names to the different styles, textures and prices is obvious, and greatly assists the dealer in his advertising and displaying as well as the wearer in purchasing and ordering.

Modern Machinery of the Mill.

In making a tour of the Richmond Mills the machinery is really the throbbing heart of the place. The knitting machinery is situated in the 2nd floor of the building. It is of the most modern make as adapted to hosiery, and includes some of the most advanced patents. The main engine is distinctive inasmuch as the huge wheel has run without interruption for nine years night and day, excepting only the Christmas holidays. Of course there are two crews of men constantly in attendance upon this mammoth unit of our modern industrial life, and after all, much of the efficiency of the mill work is due to the perfection which the machinery has reached in doing every particle of work possible to be accomplished by mechanical movements.

Garnett Andrews, the Real Force.

But as vital a part of the whole plant as is the gigantic wheel whose every revolution means force applied to some part of the mill work, there is yet another force equally as vital, certainly more virile and always more to be relied upon than any possible combination of iron and steel and steam and power—this force is that generated by the mind of the man to whom the management of this splendid plant, the perfect product of our Southern industrial life is a gigantic life work—a vocation as well as a profession and to whom each individual part, whether it be a twisted strand of yarn or the most perfectly finished stocking, the smallest paper box or the most mammoth order from a dealer, the humblest human operative or the most expert "hand" in the mill, is of vital moment and worthy of careful consideration. This man is Garnett Andrews, vice-president and general manager of the company.

Mr. Andrews is a Georgian by birth, having been born in Washington, Wilkes County, that State. He is a man with modern ideas, and his work in the interests of this mill means so much to him that he is willing to discuss it freely and thus to give much of the information here furnished.

Mr. Andrews is, of course, enthusiastic as to the quality of the work which goes out from the mill each year and he is equally enthusiastic as to the financial success of his company, but after all, the gravest situation which constantly presents itself to the mill owner and manager is that which is involved in the labor element. In speaking of this great human element in the mill, Mr. Andrews resents the idea which has been sown in the public mind that a mill owner is a sort of ogre. Naturally he understands, too, how misrepresentations by well meaning but misinformed people have nursed this idea, but he denies its ap-

A Picturesque Corner of the Mill.

plication to every mill owner, be he whom he may. "All new mills" said Mr. Andrews, "must necessarily reckon with an illiterate class of workers; usually they pour into the new mill from the mountains and surrounding country and they are utterly untrained either to civilized ways of living or to regular habits of industry of any kind. These people are often absolutely untutored; they are not immoral but merely unmoral; their views of life are so limited that they have developed neither judgment, discretion or any other mental attribute, while physically they are practically as ignorant of the commonest rules of civilized life as an infant. And it is this element to which

the cotton mills of the South have opened wide the doors of advancement and improvement."

Mr. Andrews recalled a case of a girl of twelve whom he particularly noticed soon after this mill first opened. She was simply a little savage to whom the usages of ordinary life were unknown. To-day that same girl is well dressed, well mannered and is still at work in this same mill. She is doing well and is apparently well satisfied with her new life and what it has meant to her. Mr. Andrews believes that immorality among women mill operatives is the exception rather than the rule. Many of the young women marry, he declares, to the soldiers at the Chickamauga Army Post, but also many of these return to work in the mills often, because they are insufficiently provided for by their husbands, and too, because the habit of independence has become too fixed to be dislodged.

View of the Ribbers in the Knitting Mill.

There are cases, too, which are well known where whole families have come into the mill and have prospered more than usual, the men learning for the first time that they have an aptitude for some special branch of mechanics, follow it away from the mill, while the women rise to the positions of teachers, overseers and forewomen. It is also a source of pride to the owners of the Richmond Mills that the sanitary conditions of the mill are such as to make wholesome, healthy lives the rule rather than the exception, and this fact is self-evident to all who enter the light, odorless and well ventilated work rooms. Another fact that gives special point to work in this mill is that reliability and steadiness is recognized as a valuable asset, even though it is not invariably accompanied by ability.

THE SOLUTION OF THE CHILD LABOR PROBLEM.

In considering the general question of mill labor, the efficiency of the workman, as well as his moral and economic status in the community, and chiefly in considering the relation of the mill owner to the operative, the great special question perplexing every mill today is that of child labor in the mills. To this question, Mr. Andrews has given careful and thoughtful attention coupled with personal experience and experiment which makes his conclusions of real value. First of all the social conditions at the Richmond Mills are unusually good; there is no welfare work or social settlement philanthropy here, but, as has been said the mill operatives form most of the population of the town which has an average amount of advantages ordinarily possessed by a suburb of some 1,000 inhabitants. But in this town as in larger ones there are families of various grades of fortune. The law of Georgia (and of Tennessee) provides that no child shall be employed under the age of fourteen years. But this same law makes no provision for the child under that age; he may be permitted to become a burden on the community or even a menace to society itself. Should such a child, whose parents, perhaps, are both working in the mill, be forced to play about the streets all day, his condition is far worse, both morally and physically, than if he is permitted to undertake light work in a properly managed mill.

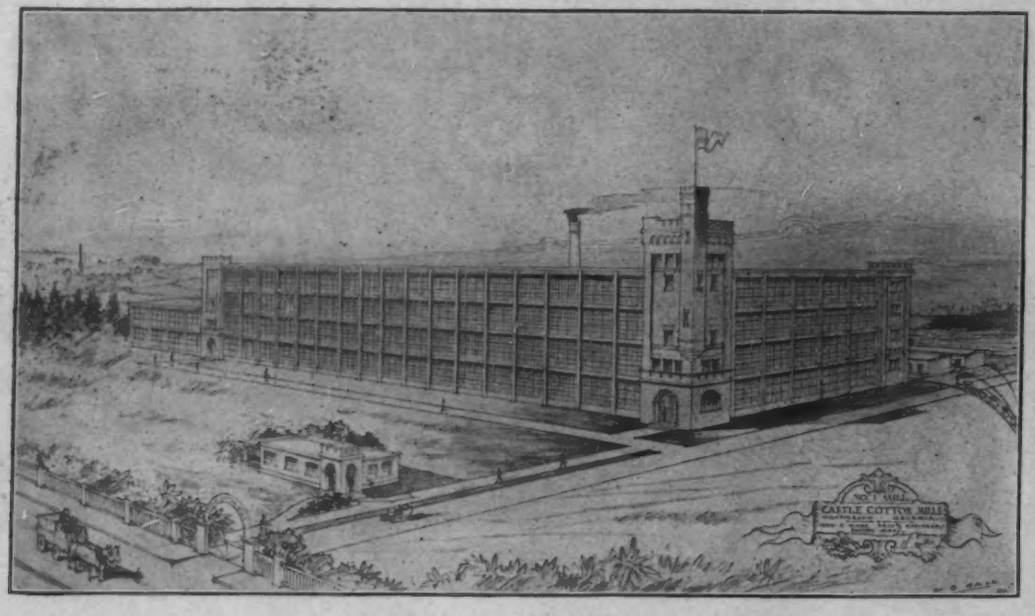
Again, every possible precaution is taken to prevent the admission of children under the legally appointed age. For this purpose a careful register is kept of the age of the child, the name, residence, nationality of the parent, the date of the parents marriage, if possible, and any other information which may be available. In addition, if the child has attended school, a certificate to this effect stating registered school age, length of attendance, etc., is secured from the school. And it is this certificate of school attendance which influences the admission of a child into the Richmond Mills. Mr. Andrews states that apart from all humanitarian reasons, he accepts the child with school training in preference to the one without because, first of all, he is trained to obedience and discipline, and second because he learns mills rules and working methods infinitely better after he has had school training than before. Thus, for perfectly apparent practical reasons, Mr. Andrews believes that the one and only solution of the great national, and international child labor problem is a uni-

versal system of compulsory education. He believes, too, that such a law if properly carried out will receive the fullest indorsement and heartiest co-operation from mill owners everywhere, and he sincerely hopes to see this great question of child labor taken out of the hands of the individual and consigned to the keeping of the State, because compulsory education for a fixed number of years would place the child where the good of the nation demands that he should be—in the school room, under proper discipline and careful tuition.

FUTURE OF THE SOUTHERN HOSIERY BUSINESS.

In discussing the future of the hosiery business in the South, Mr. Andrews thinks the possibilities for success are limitless. He believes, too, that the principle of concentrating within the plant itself the main avenues leading to the actual manufacturing of the articles, and required for the exploitation and marketing of the finished product, will insure the highest measure of success. So entirely is this general principle followed that the Richmond mill is carefully divided into separate parts or departments, each under an efficient head. There are associated with Mr. Andrews, his brothers, O. B. Andrews as secretary, and Champ Andrews as advertising and publicity manager, while the president of the company is J. S. Bell.

The extensive offices of the mill are supplied with modern appliances for facilitating the work, and the army of clerks, stenographers, bookkeepers, etc., here employed might well represent a high grade financial institution rather than an industrial enterprise. In this equipment the general policy of completeness is fully carried out, and perhaps it is this close attention to every detail of the huge enterprise, from the most minute to the most important that combines to make of the Richmond Mills an industry which merits the success that has come to it and which does credit to the community in which it operates.



A REINFORCED CONCRETE COTTON MILL.

(*Contributed Exclusively to* Cotton.)

BY FRED S. HINDS, ARCH.-ENGR.

The many advantages of reinforced concrete has led the management and the architect-engineer of the Castle Cotton Mills, Ltd., to decide on this class of construction for the building of this mill at Monticello, Georgia.

The illustration shows the exceptionally wide window area, about 90 per cent. of the wall area, that is possible only in this kind of construction, making it possible to get excellent light into the two weave rooms, which will be located on the first and second stories, the card room on the third and the spinning room on the fourth. The main mill will be 500 feet long and 129 feet wide. There will be ten cotton store houses, a boiler house for heating and slashing purposes, an office building, a transformer substation and a village of about 125 cottages. These cottages will be of cement stucco, with asbestos shingle roofs. They will be supplied with water and a sewerage system to be connected into the main sewerage of the whole plant. Electric lighting will also be installed.

While the mill plant will be practically fire-proof, provision will be made to have the contents thoroughly protected by automatic sprinklers, which will include a 100,000 gallon standpipe and complete system including 1,000 gallon fire pump. A large reservoir will be built furnished by springs at the site of the mill plant.

This plant will be provided by electricity obtained from the Central Georgia Power Company's Hydro-Electric plant on the Ocmulgee river, nine miles from the Castle cotton mill site. The latest method of electric drive will be installed throughout the mill to operate the 50,000 producing spindles, 5,000 twister spindles and 1,200 automatic looms. The electricity supplied to the mill will be transmitted at a pressure of 66,000 volts and reduced at the mill transformer station direct from 66,000 to 550 volts. This same current will be transformed to furnish lights for the main mill, mill buildings and mill village. Side track connections will be made from the Central of Georgia Railroad, and have direct connection by the same system with the Ocean Steam Ship Co., at Savannah, Georgia. William T. Lang is president and general manager of this company.

THE SOUTH'S TEXTILE OPPORTUNITIES.*

BY COL. L. D. TYSON, PRESIDENT KNOXVILLE WOOLEN MILLS, KNOXVILLE, TENN.

We are justly proud of the vast quantities of wheat, corn, oats and other cereals that we raise; we are justly proud of our immense manufactories of steel, iron and lumber; of our vast production of coal; of our gold, silver, copper, and the other metals; and of our greatness in every other direction; but, greater than all of these, is our God-given monopoly in the production of that product which is still the king of all industries and products, King Cotton.

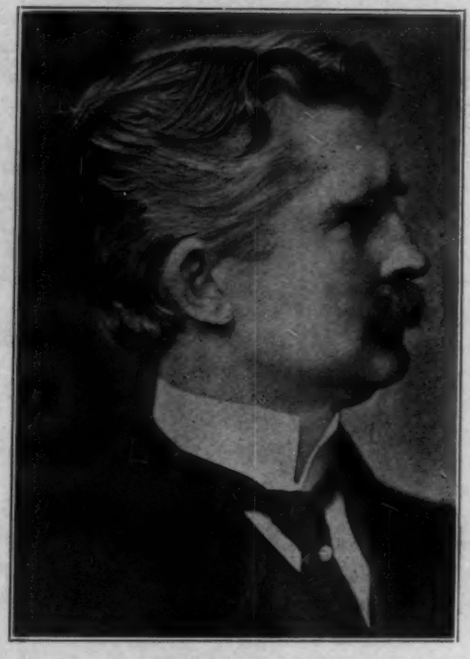
Twenty years ago there was hardly a knitting machine to be found in the South. The people were entirely unacquainted with them and there was no labor whatever that knew anything about the use of knitting machines. Since that time the knitting industry has been taken up by the Southern people and today there are more than fifteen millions of dollars of capital invested in this industry in the South. Nearly every town in the cotton belt now has its knitting plant, and many have several, and they have proven when properly managed, even more prosperous than the weaving plants.

The principal textile industry in the South today is and always will be, the spinning, weaving and knitting of cotton. The South has peculiar advantages in this respect. We have the cotton right here at our doors. We can easily select the grades we want. We can buy it at first hands and do in fact get lower prices than the manufacturers who are far away. We buy it either from the farmer himself, or from the first man who buys it from the farmer. There are not so many middlemen, all of whom have to have a profit. There are not so many freight, insurance and warehouse charges. Furthermore, the South is blessed with an abundance of cheap coal and building materials, in many instances right at the doors of the mills. The South also has an abundance of good and tractable labor that is only too glad to get an opportunity to earn the increased wages which the factories provide. There are today in the course of development within the cotton manufacturing area of the South, more than two hundred and fifty thousand hydro-electric horsepower, and there lies ready and waiting the magic hand of capital and industry, a million more that is capable of easy development.

When we consider the conditions under which the Southern people have labored, the growth of the cotton mill industry in the South has been little short of marvelous. In the year 1880, the South had only 542,000 cotton spindles and used only 188,000 bales of cotton. In 1890, these spindles had trebeled to 1,554,000 and she was using 540,000 bales of cotton; in 1900, the spindles had been increased to 4,300,000 or almost three times again, and the cotton used amounted to 1,523,000 bales; in the year 1910, the spindles had increased to over 10,000,000, with a capitalization of $250,000,000, and the cotton used to 2,250,000 bales, being a greater amount of cotton than was used in all the rest of the country.

* Extracts from an address delivered before the Southern Commercial Congress.

I am delighted that this great organization, known as the Southern Commercial Congress, is doing what it can to bring the resources of the South before the people of this country, and nothing is more encouraging to us than to see the great men of the North, in politics and business, meeting with the men of the South in a common cause for the upbuilding of our great Southern country. It shows that we are a common country, with common interests and aspirations and that whatever helps one part of the country must help in some manner the other parts.



COL. L. D. TYSON.

Notwithstanding the fact that our Southern mills have the great advantage of being right here in the cotton fields, yet the whole country is exporting less than three and one-half per cent. of all the exports of manufactured cotton goods in the world. Let us open our eyes to actual conditions. We are in the habit of speaking in the press and on the hustings with the greatest contempt of the effete monarchies of the Old World and the pauper labor of Europe, and yet these same effete monarchies and that same so-called pauper labor, have practically driven our textile manufacturers out of the markets of the world, until today we do, as I have said before, only three and one-half per cent. of the textile export trade of the world outside of our own country, and nothing but a tremendous tariff wall permits us to retain our own markets.

There is another thing we must not overlook. In the last twenty years a new Giant has arisen in the Orient—a Giant whose possibilities are so great that when we consider what he has accomplished in forty years, the human mind can hardly conceive what he may accomplish in the next forty years. I mean the Japanese. They are today building spinning and weaving mills. They are buying our cotton and weaving it into cloth and selling it to China and Manchuria. They will improve and increase their business with each succeeding year. Unless we wake up, in ten years I expect to see them largely in control of the cotton goods trade of China and Manchuria, especially the class

of goods that is made in the South, and it looks as if nothing but an export duty on cotton will enable us to compete with them at all.

I do not wish to be called a pessimist, but I understand the object of this Congress is to benefit our people. I think a word of caution, or warning, is as necessary and as valuable at the proper time as a word of encouragement. There is something wrong in our country. While the textile plants of the Old World have been generally running full, the ones in this country are running on short time, exporting but little or nothing, and but few making money and many actually losing it today. Nearly every man has his idea of the cause, but when all is said and done, and conclusion has reached its last analysis, I believe the *prime* cause will be found in these two words, "tariff and transportation."

It is a well known fact that no town or city can thrive unless it has as good freight rates and transportation facilities as other towns. It is a well known fact that we are sadly behind the other manufacturing nations of the world in ocean steamship transportation. We control comparatively few ocean lines and to many parts of the world the transportation of freight is not certain, the sailing of ships are not sure, and the rates and delivery of freight irregular. Can we hope to compete until these conditions are corrected?

Furthermore, we are living in this country on an inflated scale. We have a wall around us, and everything we eat and wear, and have, is higher than it would be if our tariff was low enough to permit a greater commerce with the world. Owing to this tremendous tariff wall and the natural extravagance of the people generally in this country, we have gotten our scale of labor and living so high, that we do not produce cotton goods as cheaply as they can be produced in other portions of the world where the cost of living is not so high.

In my judgment, with all the advantages of better living and higher orders of labor, which we claim to have in this country, I do not think these advantages are great enough to enable us to produce cotton goods in competition with the rest of the world, as long as we pay more for everything we have, including the machinery, supplies and labor required for manufacturing than the rest of the world. I believe this country is living in a "Fool's Paradise" and that sooner or later conditions must be adjusted. My idea is, that we ought to begin to adjust *all* duties gradually to a lower basis, so as to get our conditions to such a plane that without reducing the purchasing power of labor, we can compete with the rest of the world.

There is only one other alternative and that is for this nation to make up its mind that it will not undertake to compete with other portions of the world, but will make a tariff so high that no article manufactured abroad can be imported, and thus insure our home market for ourselves alone. I am in favor of reasonable duties on everything we can manufacture and I believe it would be a calamity to lower duties, except in a gradual, systematic and scientific manner, but if we are to have our proper influence in the world as a manufacturing nation, we must improve our ocean transportation and gradually get on a lower plane of prices.

The future of the textile opportunities of the South are so wrapped up in the export trade that I have been emphatic in speaking of conditions. The South certainly has great natural advantages over the rest of the country in the matter of cotton manufacturing and especially in export trade, but the lack of this export trade is causing our Southern textile interests to languish today. It behooves us to realize conditions as they are and to set our faces to the future determined to remedy whatever evils exist. If we are inefficient in our manufacturing we must correct it. If we do not make the proper effort to get foreign trade we must correct that. If it is a defective marketing of our goods, through ignorance of conditions required abroad, we must wake up and correct that, too. I have reason to believe that we are needing improvement in every one of these conditions.

If we would trade in the Orient we must correct economic conditions in this country so we can compete in prices and then we must send our agents into every market where we hope for trade, and we must stand our ground and never be driven out until we are willing to admit that we are an inferior race. I do not think that we are ready to admit that, and as long as cotton can be successfully manufactured in this country, I believe I can say with all due respect to the other portions of this country, that its natural home is here in the cotton fields and I believe it can be manufactured here more successfully than anywhere else. The possibilities opening up to the Southern manufacturers of cotton goods are simply boundless, but until conditions are improved, I can see only our home market, which, while vast and constantly increasing, can never fill the eyes and minds of this expanding and ambitious Southland.

IMMIGRATION AND THE SOUTH.*

BY T. V. POWDERLY.

"When I was invited to preside over the Immigration Section of this Parliament of Prosperity, I was asked to so shape my remarks as to voice the sentiments of the people of the great sovereign States to be represented here. I was to speak on a subject, and preside over a section dealing with a question that now occupies the thought of the laborer and capitalist, citizen and statesman as never before.

Sixteen Southern States united in extending an invitation to our illustrious President to speak to this gathering on the subject: "A Greater Nation Through a Greater South." These sixteen States contain within their border 969,927 square miles of land as rich in agricultural and mineral wealth as the sun smiles on in its endless journey. Here and there throughout the South the magic wand of labor has uncovered a small part of what the Creator deposited in the earth as mineral, but only the surface has as yet been scratched.

And what will these millions of acres of untouched land produce. Food to supply the inhabitants in rich abundance, cotton to clothe the millions of the earth and then have enough left over to be worked into a hundred articles of household and mechanical use. Ore enough to supply the world with its iron and steel and coal enough for the earth's millions. There is no fruit or flower, grain or vegetable, with the exception of a few tropical products,

* Extracts from an address delivered before the Immigration Section of the Southern Commercial Congress.

that cannot be grown to perfection in one or the other of these sixteen States.

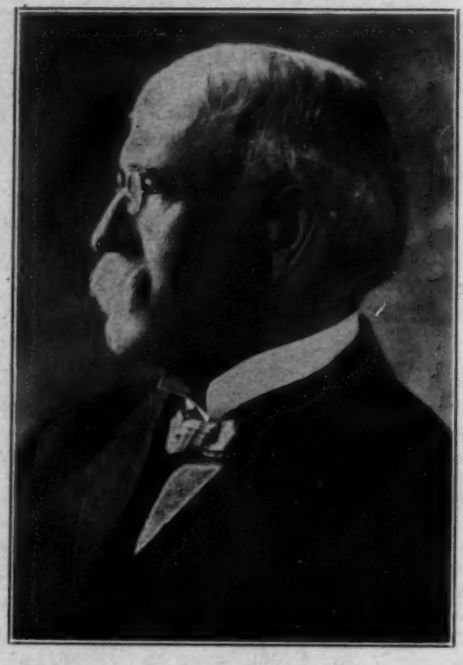
Ten of these sixteen States border on the sea. They have a coast line of 2,999 miles, exclusive of the navigable inlets and rivers. The other six States have magnificent rivers that flow to the sea capable of carrying the commerce of all the States. Great railway trunk lines have pushed their way into the principal parts of the Southern States and are shooting their branches in all directions. Though gifted with the keenest possible penetration of vision you cannot foresee the possibilities of this greater South, they are so stupendous that contemplation of them staggers the imagination.

Having demonstrated with a reasonable degree of certainty that the great South, through the progress of which our country is to grow greater, more powerful, more esteemed and respected among nations, is prepared to receive more immigrants, let us essay the task of describing the kind and quality of man she desires. Do not mistake me when I say immigrant. It is not the man who crosses the ocean to seek a home with us that I single out for this designation. Not only the European fresh from the Old World but the Canadian and the man from the North, East and West of our common country who wishes to live in a milder climate, are to be classed as immigrants when knocking for admission here.

You need men in the South, strong, willing, industrous men. Men with ambition to own a home; men who can adapt themselves to the way of the South. Men of families who will bring their families with them, apply themselves to the soil and abide among you. And you should give a thought to colonization too. Man, no matter where he comes from, is a social animal. No matter how good a worker he may be, he needs the companionship of men who speak his language. You should therefore think over the matter of colonizing in such places as are adapted to it.

Having given my idea of what you have to offer to the man who immigrates here and what manner of man this immigrant should be, let me tell you of a machinery to bring the man with the hoe and the land to be hoed together. Congress enacted a law in 1907 creating a Division of Information in the Bureau of Immigration and Naturalization, the duty of which is to collect information from all sources concerning the resources and physical characteristics of the States desiring immigration and to co-operate with the various States in promoting immigration. Do you believe that if the Division of Information has been established years ago, that if the resources of the South had been recorded on its books and in its bulletins; that if the existence of that Division had been properly advertised, the thousands who left the United States to seek land in British Columbia and Manitoba would have turned their faces away from the South and settled where it takes all they can make to house themselves, protect their stock, and guard against blizzards?

Let us save to the United States these hundreds of thousands of hardy, industrious men, by letting them know of the advantages the great South has to offer and by giving them the opportunity to avail themselves of these advantages. Let us stop the outgo of Americans to the frigid northwest of Canada by letting the people know of what the South has to offer. Establish your State Boards. If you don't wish to call them boards of immigration call them boards of opportunity, or anything else you please, but set them in motion and build the South up as she should be built. While we are building the greater South, do not forget that we are building the entire nation, for whatever is done to add to, strengthen, improve or make richer any



T. V. POWDERLY.

one of our States, adds to, strengthens, improves and makes richer every other State. While we are here to build up a greater nation through a greater South, we are not unmindful of the States not represented here for we are all Americans and as we are kin to each other, our hopes, ambitions, ideals are also kin.

It is my hope, that before this Congress adjourns, it shall have adopted a resolution briefly stating what the new and great South has to offer to the home seeker, what kind of man we shall invite to make his home here, and ask the various States represented here to co-operate with the Federal Government in directing the right kind of people to the South with a view of bringing good men and good opportunity into harmonious relations, for our aim is unity, amity and prosperity for all the Nation through a greater South.

EIGHTH INTERNATIONAL COTTON CONGRESS.

The eighth International Cotton Congress will be held at Barcelona, Spain, on the 8th, 9th, 10th and 11th of May, 1911. The proceedings will take place in the large hall of the University of Barcelona, Calle de Cortes.

The following is the preliminary program:

FIRST DAY'S PROCEEDINGS, MONDAY, MAY 8TH.

10:00 a. m.

Address of the President of the Congress, Eduardo Calvet, (Spain). Official Addresses. Address and report of the work of the International Cotton Federation for the year 1910-11, by Sir Charles W. Macara, Bart., chairman

of the committee. Financial Statement, by Casimir Berger, Hon. Treasurer. Cotton Growing.

2:00 p. m.

Sectional Meeting 1.—Chairman Jean de Hemptinne, (Belgium). Subject—Usages and conditions of sale of cotton yarns in affiliated countries.

Sectional Meeting 2.—Chairman J. B. Tattersall (England). Subject—Mill fire insurance.

SECOND DAY'S PROCEEDINGS, TUESDAY, MAY 9TH.

9:30 a. m.

Chairman, M. Jacinto Magahaes, (Portugual). Report of sectional meeting 1 on usages and conditions of sale of cotton yarns in the affiliated countries. Report of sectional meeting 2 on mill fire insurance.

2:00 p. m.

Sectional Meeting 3.—Chairman, G. Mylius, (Italy). Report on organization of the various affiliated countries. Meeting of arbitrators on yarn and cloth contracts.

Sectional Meeting 4.—Chairman, Arthur Kuffler, (Austria). Report of Arthur Kuffler and H. W. Macalister, (England), on the Conference with Cotton Exchanges. Conditioning of raw cotton. Cotton bills of lading and guaranteeing validity.

THIRD DAY'S PROCEEDINGS, WEDNESDAY, MAY 10TH.

9:00 a. m.

Chairman, John Syz (Switzerland). Report of sectional meeting 3 on organizations of the affiliated associations. International arbitration on yarn and cloth contracts. Report of Sectional Meeting 4 on the conference of cotton exchanges with the representatives of the international federation. Conditioning of raw cotton. Cotton bills of lading and guaranteeing of validity. Voting on resolutions. Change of rule 24 of statutes. Levy for 1912. Next Congress. Votes of thanks.

SOCIAL PROGRAM.

Monday evening, May 8th, at 9:30 p. m., reception and conversazione at the town hall, ("Casa de Ayuntamiento"), of Barcelona.

Tuesday evening, May 9th, at 8:30 p. m., gala performance at the "Gran Teatro del Liceo."

Wednesday, May 10th, at 1:00 p. m., banquet in the "Tiabidabo" given by the "Fomento del Trabajo Nacional." At 9:00 p. m., banquet given by the "Diputacion Provincial" in the large hall of "Saint George" in their palace.

Thursday, May 11th, at 10:00 a. m., departure by special train from the "Estacion del Norte" for Montserrat. At 12 noon, arrive at Monastery of Montserrat, where there will be served at 12:30 p. m. a luncheon, given by the Spanish Master Cotton Spinners' and Manufacturers' Associations. At 4:00 p. m., return to Barcelona by special train. At 9:30 p. m., concert in the "Orfeo Catala."

Ladies are invited to all the festivities.

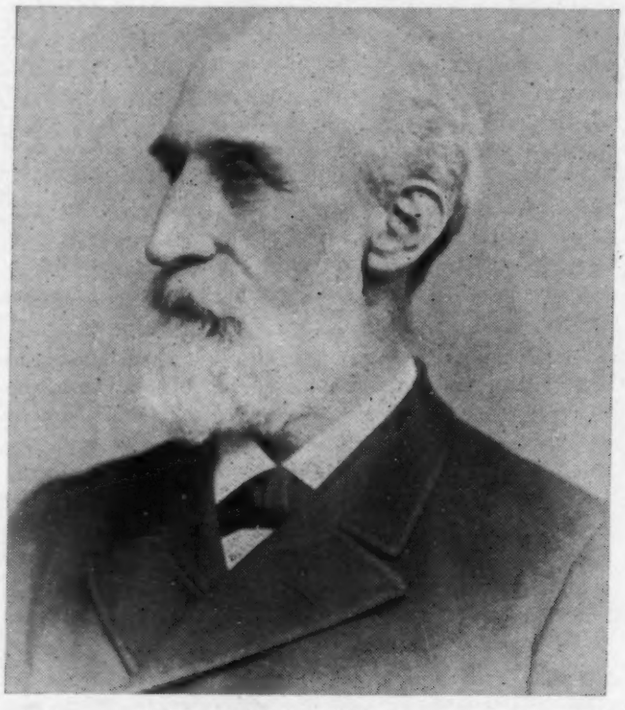
PLANS COTTON CENTENNIAL.

The Fall River Merchant's Association at a recent meeting voted unanimously to adopt plans for a vast cotton centennial carnival to be held in Fall River from Monday morning, June 19th, to Saturday night, June 24th. The occasion is to celebrate the one hundredth anniversary of the establishment of the first cotton mill in Fall River which is the old mill at the "Globe Corners." The program in detail will probably be announced later.

OBITUARY.

Hon. Thomas Adamson, former prominent Philadelphian, whose distinguished services in a number of important consular posts were rewarded with high honors by foreign countries, died at his late home in Cedartown, Ga., on March 6, 1911, from a protracted illness.

Mr. Adamson took an active part up to the time of his death in the management of the Cedartown Cotton and Export Company, of which he was treasurer. He is survived by a son, Hon. Charles Adamson, a member of the Philadelphia bar, and president of the Cedartown enterprises.



Hon. Thomas Adamson.

The late Mr. Adamson was a native of Chester county, Pa., where he was born in 1827. His ancestors on the paternal side were Friends, and on his mother's side descendants of the French Huguenots. He was the son of Charles Adamson, and his mother was Mary Corson of the well known Pennsylvania family of that name. He married Sarah Victorine Wright, of Philadelphia, in 1856, and for some years was engaged in the mercantile business in that city and later in the West.

From the beginning of the Civil War until 1893, Mr. Adamson rendered important and honorable service in the consular branch of the department of State, serving as consul general for the United States in Brazil, Hawaii, Australia and Panama. During this period he was frequently praised for his unswerving devotion to his official duties, and for always manifesting a high sense of right and justice in dealing with the subjects of other countries.

Shortly after he left the consular service in 1893, Mr. Adamson came to Cedartown, where he at once entered into the active management of a cotton manufactory and the development of large tracts of land.

SOME CAUSES OF POOR TRADE CONDITIONS.*

(*Contributed Exclusively to* COTTON.)

BY A. R. Y.

Complaints against poor trade conditions are heard on every hand. The average net returns of all textile manufacturing concerns show balances on the wrong side of the ledger. Like conditions have prevailed for two or more years, and might have been worse but for an all-wise Providence sending two short crops of cotton in succession, thus watching over the destiny of manufacturers who have not been far-sighted enough to safeguard their own interests. The most common reasons given for this deplorable state of affairs are, the lack of foreign trade and under-consumption in our home markets. Also the tariff and transportation are occasionally cited as the chief obstacles in the way of making reasonable profits.

To show that these opinions are not well grounded, it is only necessary to note that the poundage loss in export goods for two years is nearly offset by the difference in the number of pounds of cotton grown during this period and that our home markets have absorbed the balance—whatever it was. As for the tariff and transportation, it would be difficult to figure out how either are responsible, or both combined could adversely affect conditions to any considerable extent. Since the difference between these items now and what the most radical might wish to substitute would be too little to insure profits under present conditions.

All the cotton ever grown has been spun, sold and consumed; the production of spindles has kept well up with the supply of cotton; stocks of both cotton and goods are comparatively low at the present time; therefore all this talk about under-consumption in our home market is without foundation in fact and not the true reason why there is no profit in the textile manufacturing business today. Short running time has curtailed production, but to no greater extent than would have been forced later each year through a short supply of cotton.

Considering all of these facts it is evident that a decision to curtail was delayed too long to secure the results intended. Yet, we see that this inactivity would have been quite sufficient, had the time to restrict production been properly chosen instead of forcing goods on the market just a little ahead of time without waiting for a healthy demand. It is a matter of record that the goods were needed—because all have been taken at a price and would have been consumed just the same at a reasonably higher price had the production been properly regulated in point of time. Among the most disturbing elements, are those who purchased cotton early at low prices and without having orders for goods who later, in order to secure a greater share of trade than they were entitled to, booked business on a break-even basis at the price they paid for cotton, in place of standing firm for prices based upon the price of cotton the day these sales were made, and that other unfortunate class who were forced to run by creditors, possibly their selling agents, to keep their accounts alive.

Having considered the situation from different standpoints, it would seem that an intelligent and practical solution might be reached without consolidating the mills and taking chances of Governmental inquisitiveness or something worse.

Individual determination and action is the best possible way to affect results and the only feasible way to accomplish anything worth while. If every man who buys cotton at a low price in advance of his requirements will base his acceptances upon the price of cotton the day he sells his goods, (if the price of cotton goes against him he will be obliged to), he will not only get the advantage he hoped for when he jeopardized his stockholders money, but be supporting the market and acting with wisdom, if not with some consideration for his competitors who are entitled to a fair share of trade at all times.

The day has gone by when one concern, in a business in which many are engaged, can be more successful in the long run than others. For a while it may be possible to grasp an unfair proportion of orders during dull trade, but when trade is slack for a long time, things will even up and affect the strongest. From appearances the present is such an occasion and the proper time for each individual concern to adopt rational measures with due consideration for the rights of others.

Doubtless the most effectual plan would be for each separate concern to keep out of the cotton market this fall, except for supplies to meet actual requirements for goods on order, base all sales on value plus a fair profit, letting the future take care of itself. If the demand for goods is not sufficient to run full time and production, cut production. We know by bitter experience that production and consumption are running too close together to warrant any crowding of the consumer.

Take a lesson from our farmer friends, who learned individually several years ago the fallacy of selling their whole crop in a few months. It is against all economic laws to make heavy purchases from a limited supply to over-produce any commodity. Speculation has the most to account for. The greedy concerns with low price cotton threw away their opportunities and cast hardships upon their competitors at the same time. The force of economy will compel a change in business methods, if present conditions are allowed to continue much longer, but it will be too late then to save this important industry from great loss.

* This article is contributed to Cotton by one of the South's best known and most able authorities on cotton manufacturing conditions.

OBITUARY.

Haven C. Perham, of Lowell, Mass., treasurer of the Kitson and the Lowell machine shops and one of the best known textile machine manufacturers in America, died on March 27th, of pneumonia, at his home on Wannalancit street after an illness of two weeks. Mr. Perham was born in Tyngsboro, Mass., October 5th, 1851. His father, Sargent Perham, was also born in Tyngsboro, while his mother was Sarah A. Damon, of Amherst, N. H. In 1876 he married Miss Clara A. Tucker. He is survived by his wife and one son, Roger Haven Perham, and by one grandson, Roger M. Perham. The shops with which Mr. Perham was connected are two of the largest plants of their kind in the United States and the well known reputation of the Kitson picker is largely due to the personality of Mr. Perham.

Mill Conditions and Market Reviews.

SOUTHERN MILL SITUATION.

(*Special Correspondence.*)

From the standpoint of the markets, there has been little if any improvement witnessed in the South during the month of March. It had been hoped all through the winter that March would see an upward shoot of prices, and a stiffening of demand in yarn and cloth circles. This has not been realized, and the situation is gloomy. In fact many manufacturers have expressed the opinion that there will not be any material change before September. Others, however, take a more optimistic view, and confidently expect the return of something like normal trade conditions by summer.

Mill men are facing a serious situation. In a few special lines trade has not been so bad, but taken as a whole there continues to be a fatal disparity between prices of raw material and prices offered for goods. In consequence of which mill men are following the course which to them seems wisest. There have been no meetings during the month to consider curtailment, and there is no talk of any called meetings of any of the textile associations. The impression seems to be prevalent that the best thing to do is for each spinner to map out his own course, follow an individual policy, and meet the situation as best he can. Many manufacturers, facing the problem as it is, have fallen upon the curtailment remedy. During March curtailment was much heavier than in preceding months of the winter. In fact it is stated that curtailment in the South during the month has amounted to 25 per cent., and that this will be kept up unless there is decided improvement in trade conditions.

T. W. Crews, secretary of the Southern Hard Yarn Spinners' Association, was asked today for an estimate of curtailment among Southern hard yarn mills. He places his estimate at 25 per cent. In his opinion this percentage will be kept up throughout the summer unless there is pronounced improvement. He does not look for any material change in the yarn situation before late summer or fall, now that March has gone by without any show in that direction. However, he stated that his hopes had been disappointed so often during the past two years that he did not care to make any more positive predictions.

In Spartanburg eight large mills closed down for one week, and throughout South Carolina heavy curtailment has been effected. It will be recalled that at a meeting some weeks ago of the South Carolina Cotton Manufacturers' Association it was decided to curtail heavily between March and September. So it is generally expected that April will witness a sharp stoppage of spindles all over the South. There is little else to be done since prices generally quoted represent little, and in most cases no profit at all on production.

Still, contradictory as it may seem, there are some mills which report fairly good business, and some are making full time. For instance mills at Bessemer City, N. C., are said to be running day and night to keep up with orders.

The biggest piece of mill news during the month was that relating to the proposed cotton mill merger, backed by Capt. Ellison A. Smyth, of Greenville, and other well known mill men of South Carolina. It is generally predicted that during the next few years many more large cotton mill mergers will be announced, and it is believed the Dukes will control the greatest string of mills. The plan, recently announced by the Dukes for combining the products of export mills under one management in order to open up a market in China has caused a great deal of comment among mill men. It is likely that this scheme will be taken up seriously before long. Exports from the South to China have fallen off many million dollars during two years past and it is believed that any feasible arrangement which shows promise of reviving export demand will be accepted by Southern export manufacturers.

A well known local manufacturer has given out an interesting interview along this line. He says: "I would like to see two big mergers in Charlotte. One for the cloth mills and the other the yarn mills. There is some sort of merger in this State now with the so-called Duke mills, headed by W. A. Erwin, of Durham, but there is no classification as to goods produced. Generally speaking the groups of Parker and Smyth mills are of a class which makes the combination economically feasible. In fact in this day of hard times and unsettled market conditions the community of interest feature makes it almost a necessity. The problem of cost of production which includes a hundred and one details, of material, supplies, labor, operation, as well as the cost of marketing goods all go to make the merger of mills desirable from a business standpoint. In the South where the mills are so numerous, and as a rule so small, the maintenance of separate organizations for each individual plant augments the cost of output to a place where the mammoth combinations have all the advantage. Hence the change. There is another feature which will have its weight with the industry in the gradual alignment of mills in groups, and that is the problem of curtailment. As is well known the present deplorable state of the industry would have been greatly obviated if consistent and co-operative plans of curtailment had been carried out. With a majority of the mills of the country in groups and with the heads of groups forming an executive committee the markets could be regulated without experiencing such conditions as the industry has undergone during the past several years. I believe that there will be a dozen big combinations of cotton mills in the South within the next few years and that the biggest of all will be the Duke combination which will include not only the mills in which J. B. Duke now owns a controlling interest, but the so-called Southern Power group as well. With the organization of the mills, the perfection of the Duke plan for building up the export trade in China and the Orient will be facilitated. All in all, the grouping of the mills is a great step forward in the line of economic progress."

Some time ago the Chadwick-Hoskins mills in Charlotte and vicinity were merged under one management, and have prospered remarkably since. This was the first big merger in Charlotte. It was rumored from the time of the Parker announcement that other big mergers would follow, and the Smyth combination goes to prove the truth of the rumor.

At present the Dukes are heavily interested in a string of large mills in North Carolina, and along the power sites

of the Southern Power company, of this city, other big mills are to be established. In fact the mill at Great Falls is said to be complete at present. When this mill was announced it was stated that others would follow. So it is generally believed that eventually the Duke string of mills will be the largest in the South, and that, as stated in the above interview, before many years the majority of mills will be under consolidated management.

NEW ENGLAND MILL SITUATION.

(Special Correspondence.)

There was a serious note of depression in the cotton manufacturing districts in New England in the last days of March. Recognition of the necessity for a further revision of cloth prices without a compensating adjustment in the costs of production was forced by the reduction in a few leading lines of branded domestics by a Western jobbing house, followed by a prompt reduction in Fruit of the Loom 4-4 bleached cottons from 9½ cents to 8½ cents a yard. Revisions in wide sheetings and other bleached cottons occurred and as the month closed the feeling of buyers was that a complete revision would be necessary before confidence could be restored.

Other contributing features were the imminence of an extra session of Congress which promises to deal with the tariffs on textiles, the further delays in the announcement of court decisions awaited in financial circles, the feeling that federal corporation taxes makes it possible to add another annoying inquisition into cotton mill matters by Government employes, and the certainty that is now ahead for many mills and at hand for others, to pass quarterly dividends. In 1904 there was another such sentiment of discouragement in mill circles in this section of the country but since that time there have been substantial additions to the equipment and new and younger men have come to have a large place in executive circles.

Curtailment of production had reached a point of serious concern at the end of February, while at the end of March it came to be considered as a prudent measure that would have to be adopted.

The volume of business accruing during the month was not exploited, as it was put through at the expense of values in nearly every instance. There are very few concerns that are doing more than getting back a new dollar for an old one and most concerns are not doing near so well as that. At Fall River, it was pointed out by one leading mill manager that stocks of goods were being held down through a curtailment varying at the end of the month from 75,000 to 100,000 pieces weekly. The total stocks of all kinds of cloths in mill hands did not exceed 1,250,000 pieces and they were scattered among many mills and in fully 200 different constructions.

Rhode Island mills sold quite freely during the month at lowering prices, business on bleached goods, twills, sateens, etc., having come forward from the converters when values finally went to pieces. Competition for business among the New England mills has now become keener than it has been for some years past and the more experienced manufacturers are growing more cautious in their movements. After announcing a price of 8½ cents on Fruits it was decided to peg the price at 8¾ cents until June, showing a desire to steady the situation but at the same time to accept business on a very close margin.

In New Bedford the pressure for further curtailment grew steadily as the month went on and contracts expired. In most years, users of fine cottons would be busy looking ahead for the coming spring by the later days of March, but this year new contracts have come forward very slowly and some of the best managed and best equipped mills in that center have business ahead that could be completed in 60 days if necessary. Not less than 13,000 looms are idle there and some estimates put the total much higher.

In the northern sections curtailment has been the rule for some time, notably in Maine and New Hampshire. The Dover branch of the Pacific mills closed for a time in the last week of the month and it is now the understanding that the Pacific mills are not anxious to operate their weaving machinery on cotton goods very freely, as they can buy gray goods in the open market much cheaper than the goods can be made. The print works is being operated steadily and even feverishly in some departments, for it is distinctly a printed goods year in the markets.

One of the unsettling things of the month was the statement of one of New England's best known manufacturers of ginghams to the effect that the best trade in these cloths was being done in the newspapers. He did not mean that the distribution of ginghams had not been large and that the demand is falling, but he wished to convey the fact to the attention of the trade that ginghams are not being sold at a profit to mills even though they may be moving in large volumes to consumers. Substantially the same kind of statement was made by the selling agent for B. B. & R. Knight, the makers of Fruit of the Loom, when he called attention to the fact that sales of that particular cloth and other brands handled by him were larger this year than any year since 1905, but the sales were made without profits to the manufacturers.

It is not to be inferred that all business is declining or that trade is not moving. As a matter of fact all gingham mills are busy, there is no change in the prospects of the mills making fall cottons, many of which are sold tight to September, the largest quilt mills are active, the printers are getting little new business on staples but are busy on old orders, and there have even been some cases of increased production being reported, as in the case of the thread mills.

The revision in bleached cottons has extended to wide sheetings, pillow tubings, and to some lines of gray cloths that had held fairly steady while strictly print cloth yarn goods were easing off. But beyond the reversion of one line of printed goods, Columbia staples from 5¼ cents to 5 cents, there has been no important change presaging a desire or intention to force losses until distributers' demands broaden a great deal. Converters made a stout attempt to get prices on fine combed yarn plain cottons to a basis of 5¼ cents for 30-inch 88x80s, 11.35-yard goods, but the best they could do was to secure some few spots at 5½ cents and futures at 5⅝ cents. The fine goods mills need business, but they are not open to take it on 60s warps and 90s filling goods at losses of 5 cents per pound.

Opinion is very much divided among New England mill treasurers concerning the staple. The head of one of the largest concerns in the world has said within a week in New England that he did not see how cotton could be reduced to the level of 12 cents that buyers and cotton bears

were talking of, and he would be very much surprised if it went at any time below 13½ cents for anything in the way of cotton that could be spun into 28s warps. Another treasurer who has had very little confidence in cotton for 18 months and has bought only as his wants forced him for a few months ahead, expressed the opinion in the New York market in the last week of the month that the cotton manufacturers of the country were making the most colossal mistake in the history of the industry in trying to meet the wishes of buyers of cotton goods who only recently had begun to restrict and limit the net profits in wholesale and retail merchandising of cloths.

The Fall River mills have begun to cut their dividends and pass them, four corporations having passed in March and three others having reduced ½ per cent. or one per cent. for the quarter. The Boston managed concerns have been in no haste to attack the dividend lists and some of them may not do so in the first half of the year, although their managers admit that they are paying from surplus accounts because those accounts were intended for that purpose. There has been no desire shown in any quarter to sacrifice mill stocks and this feature of the situation is perhaps the best answer that can be given as to the actual underlying confidence that is still felt by investors.

THE YARN MARKET.

The yarn market for the past month has shown little if any reaction from the slow business of the preceding month. The long looked for jump in cotton prices came, but so far has not materially affected the prices of yarns. Business in the early part of the month continued exceedingly dull and without feature. The knitting trade, because of a slackening up of orders for their goods, were only indifferent buyers. Considerable Egyptian yarns were bought in the Boston market for mercerizing purposes, on the continued decline in prices. The yarn market situation at this time was closely watched by buyers of cotton goods. While the jobber was willing to order in small lots for immediate requirement, it was difficult to secure any buying for the future. Some of the Southern spinning mills who had caught up with orders, took new business at quite low prices.

There was some demand for fine yarns for weaving purposes, but at unattractive prices. Coarse yarns were relatively in a better position than fine yarns at this time. Sales of two-ply warps 20s were reported at 22 cents and two-ply 30s at 24 cents, but such prices were no criterion of the market, as there was no stability back of most of the quotations. While the cotton situation at this time was much stronger it was not reflected in the yarn market. About one good business week in each month seems to be as much as the yarn market can produce.

As the month progressed a general demand for yarns remained unchanged and a sale of more than 10,000 pounds was very infrequent. Southern frame cones could be had at this time at half a cent cheaper than at the beginning of the month. There was really only one good feature at this time and that was the fact that deliveries on old orders were good. The middle of the month still showed spotty buying and a continuation of a buyer's market. Some commission houses reported weaving yarns in larger demand as compared with other lines, but this fact signified little.

New orders in knitting yarns were very limited. Philadelphia reported prices a trifle firmer and a few good orders for future delivery. The tape trade continues bad and takings for this trade are insignificant. Southern spinners seemed disposed to take some chances and have accepted quite a few orders for fall delivery at the present quotations. There seems to be no question concerning the alleged fact that cotton yarns are accumulating in the store houses of the spinners and agents. This will have no serious effect, if the spinners will keep these stocks out of the market. Whether or not they will be able to do this remains for the future to show.

The month closed with the same depressing influences that characterized the whole month. The cotton end of the men's wear trade is doing very little. Tapes, towels and damasks are slow. Haircloths, shirting and laces are fair. However the general calls for yarns from all industries is much below normal. The one bright spot is the report of much better business in extremely fine yarns, while thread yarns have a much better call. Southern spinners have been working on a few important contracts in the Philadelphia market, but those closed, narrowed down on prices until there was practically no profit in the deals. Knitting yarns have been steadily weakening all the month, although the drops have not been as severe as was the case with the weaving yarns. It is probable that two of the causes of the continuing weak market, may be found in the fact that some mills have their cotton bought and paid for and are willing to take some losses for the sake of keeping their mills going and their operating forces intact, while other mills have cotton under order and necessarily must keep selling in order to procure money to meet maturing cotton contracts.

The following are the New York quotations for the end of March:

SOUTHERN SINGLE SKEINS

4s to 8s	20 @20½	20s	22½@--
10s to 12s	20½@21	22s	23½@--
14s	21½@22	26s	24 @--
16s	22 @22½	30s	25 @--

SOUTHERN TWO-PLY SKEINS.

4s to 8s	20 @21	36s	28 @28½
10s to 12s	21 @21½	40s	29 @30
14s	21½@--	50s	35 @36
16s	21½@22	60s	44 @45
20s	22½@--	3-ply 8s upholstery	21½@--
24s	23½@--		
26s	24 @--	4-ply 8s upholstery	21½@--
30s	24½@25		

SOUTHERN SINGLE CHAIN WARPS.

10s to 12s	21 @--	24s	23½@--
14s	21½@--	26s	24 @--
16s	22 @--	30s	25 @--
20s	22 @22½	40s	30 @31
22s	23 @--		

SOUTHERN TWO-PLY CHAIN WARPS.

8s to 10s	20½@21	26s	24 @24½
12s to 14s	21½@22	30s	24½@24¾
16s	22 @22¼	40s	30 @31
20s	22½@--	50s	36 @--
24s	24 @--		

SOUTHERN PEELER FRAME CONES.

8s	21½@--	18s	22¾@--
10s	21½@--	20s	23 @--
11s	21¾@--	22s	23¼@--
12s	22 @--	24s	24 @--
14s	22½@--	26s	24½@--
16s	22¾@--	30s	25½@--

The total value of exported cotton goods of domestic manufacture for the year ending June 30, 1910, amounted to $33,398,672, whereas the import of cotton manufactures into the United States during the same year amounted to $66,473,143 in value.

MONTHLY REVIEW OF THE COTTON MARKET.

BY H. & B. BEER.

In keeping with expectations the statistical position of the staple is gradually working into a stronger situation. One month ago the world's visible supply of all kinds was 305,000 bales larger than last year; today it is only 63,000 more than one year ago, 4,309,000 vs. 4,246,000 bales, and it is probable that it will be less than last season in the very near future.

The last of a series of Census Bureau reports makes the total growth of 1910 figure 11,941,563 bales against 10,386,209 bales last year, linters included. The trade was looking for a total of about 12,000,000 bales. The report was made up as follows:

	YEAR—1910	1909	1908
Ginned, including linters.	11,941,563	10,386,209	13,432,131
Linters included in above	397,592	313,478	346,126
Sea Island, included in above	90,368	94,791	93,858
Round bales, included in above	112,887	150,690	242,305
Average weight of bales..	501.2	496.6	505.8
Active ginneries	26,211	26,669	27,598
By States—Alabama	1,217,399	1,065,377	1,360,601
Arkansas	821,235	718,177	1,020,704
Florida	68,295	62,936	71,923
Georgia	1,865,896	1,901,830	2,026,999
Louisiana	256,987	269,573	481,979
Mississippi	1,250,479	1,109,580	1,668,461
North Carolina	771,185	649,886	701,356
Oklahoma	954,433	573,786	705,200
South Carolina	1,237,037	1,164,309	1,242,012
Tennessee	326,206	253,397	349,525
Texas	3,071,263	2,554,520	3,724,575
All other States	91,148	62,898	78,796

While a fairly good crop was made this season, the total supply of cotton is smaller than last year owing to the very heavy exports of cotton to Europe from the United States. In its statement on the supply and distribution of cotton, issued March 24, the Census Bureau shows that there was less cotton in America than last year on February 28th by 411,000 bales, or 4,025,000 against 4,436,000, divided as follows:

	THIS YEAR.	LAST YEAR.
Southern mills stocks	942,000	1,024,000
Northern mills stocks	583,000	669,000
Port stocks	714,000	644,000
At 30 interior towns	546,000	620,000
Unmarketed	1,240,000	1,479,000
Total stock in U. S. Feb. 28th	4,025,000	4,436,000

Despite these bullish developments, however, the market failed to display any degree of strength worthy of mention, the present level of values being about the same as one month ago. This failure of the market to respond to the stronger position of the staple in the United States, is attributed to the unsatisfactory condition of trade with spinners, owing to the poor demand for goods. Another reason is that Europe, particularly Liverpool, has fairly large stocks.

As to the new crop outlook, preparations are going ahead under favorable circumstances. During the past week the long dry spell in the Mississippi valley and South Atlantic States was broken by copious rains and Texas and Oklahoma were favored with further beneficial rains in all sections within their borders. The result is that new crop prospects were never so favorable, especially in the Southwest, as they are today, and advices to hand indicate that the increase in acreage for the whole belt will be at least five per cent. over last year's 33,196,000 acres, which means that there will be planted in cotton this year about 35,000,000 acres. The weather, however, will be the main factor in making the crop.

THE KNIT GOODS MARKET.

The past month has been almost a duplicate of February in many respects. The demand for silk hosiery and sheer mercerized goods continues in the lead, although there has been nothing doing in the way of large orders. Manufacturers of mercerized hosiery are not taking a very optimistic view of the present situation and are not in the market for yarns in any quantities, although the prices are the most attractive offered in many a long day. The general feeling, however, is that present business indications will not warrant taking on large stocks of yarns and that in all probability yarns will still go lower. Just how this latter supposition is arrived at is hard to tell, as yarn manufacturers are now selling on the ragged edge of a loss and it does not seem likely that they are going to sell any amount of yarns, or run any length of time at any very serious loss.

Plain staple hosiery has been very quiet, particularly in the medium weights. The wide vogue of silk hose and the continued call for sheer goods has caused much dissatisfaction among manufacturers of staple lines. Sheer seamless goods to retail around 25 cents are the most popular sellers. Boys' and misses' goods in the better made varieties are rather short and when the spring trade of the retailers begins to open up, this shortage is going to be more pronounced. Most of the leading mills are working on orders of these lines of goods. While the public buying is hardly up to the normal at this time still the goods purchased show a desire for better quality. At one time there was some slight improvement in the demand for staple grades of cotton hosiery for fall, with retail price range of from 10 to 15 cents. Spot supplies of gauze hosiery in both men's and women's goods are well sold down and there is some difficulty in meeting the call for quick shipments.

Handlers of staple hosiery are coming to the conclusion that business in fine gauge seamless hosiery to retail at 25 cents or under is going to grow very fast in the next year or two. It is reported that one Eastern mill has all the work of this description it can handle running both day and night. One of the large Southern mills is preparing to handle more of this class of work and is installing machinery for that purpose. Low priced, full fashioned goods, similar to the German made goods, are in poor demand. There is considerable retail demand for tan shades in the cheaper silk and silk and lisle combinations, and also in lace and embroidered tan lisle. This would seem to indicate that tans will be worn in quantity this summer. In half hose, black and plain dark colors are in best de-

mand. Ankle embroidery effects in cheap goods are being purchased and extreme types of fancy front embroidered goods featured. Stocks of children's ribbed hose are reported to be rather low.

There is little to report of the underwear market that is new or interesting. Reorders on underwear have been very light, but taken as a whole the buying has been quite steady and there is not as much fault-finding with conditions as might reasonably be expected. Buyers are delaying the final clinching of orders until the last possible moment. Belated assortments have recently been received on blanket orders given many weeks ago. The demand is still good for cheap cotton garments for ladies' and misses' wear, but knitters are not willing to take the business, as the relation between the prices of yarns and the prices for finished material that the buyers are willing to give, does not allow them a fair profit. Some of the manufacturers of underwear are complaining of getting cancellations and requests to hold up deliveries of goods.

The demand for seconds in all grades of underwear has been a feature of the market. Particularly in the 50-cent grades this demand has been abnormal and it probably means that retailers are trying to get merchandise that can be featured in special sales at bargain prices. Jobbers' stocks are low, particularly in cotton ladies' wear of the low priced variety and the coming of warmer weather may force them into the market to secure goods to meet the calls from the retailer. Business in fancy knit goods for fall delivery has dropped off considerably in many places, even in the fancy sweater trade which has heretofore been extremely good. They still report some very satisfactory business on their books however. Goods of the better grade are in a much firmer position and a good amount of business has been placed on union suits of good quality and women's vests of fine mercerized yarn. Fall lines are in light demand and are confined principally to the best known lines of medium and light weight woolen goods and the better qualities of cotton ribbed goods.

The action of the National Wholesale Dry Goods Association in rendering a decision granting knit goods manufacturers the right to sell direct to the retailer, providing such retailer does a business of a million dollars a year or over, has antagonized many jobbers, who look upon this move as another encroachment in their legitimate business field. Credits in underwear manufacturing are being watched this year more carefully than they were a year ago and advances, or other financial aid is in many cases being withheld. It is probable that there will be an increasing demand for women's union suits for summer, in spite of the fact that they are not usually worn. The prevailing fashion in ladies' outer garments demand that all unnecessary bulk be discarded, and the light-weight, close-fitting union suit is more satisfactory in this way than muslin underwear.

COTTON MANUFACTURING.

COTTON MILL MACHINERY CALCULATIONS.

Calculations for Pickers—Draft—Speed—Length of Lap.

BY B. M. PARKER.

PART 2.

DRAFT OF PICKERS.

The draft of the breaker picker is small and seldom changed, any desired change in the weight of the breaker laps being usually secured by changing the amount of feed on the automatic feeder. The draft ranges between 1.5 and 2. The draft of the intermediate and finisher pickers is about 4, with 4 laps fed in at the back and the evener belt driving at the middle of the cones.

Fig. 4 shows the gearing of the Kitson breaker picker. There is no draft change gear on this machine.

To calculate the draft of the breaker picker from the gearing shown in Fig. 4, start with the 9 inch lap roll, placing it above the line, and alternate the gears below and above the line until the feed roll is reached, and the latter will come under the line, as in figures used in the previous article:

$$\frac{9\times18\times14\times36\times15\times26\times38}{37\times73\times13\times26\times15\times19\times2.5} = 1.85 \text{ draft.}$$

Fig. 5 shows the gearing plan of a Kitson intermediate picker or lapper with a two-bladed beater to revolve at 1500 R. P. M. The gearing for the finisher picker is the same

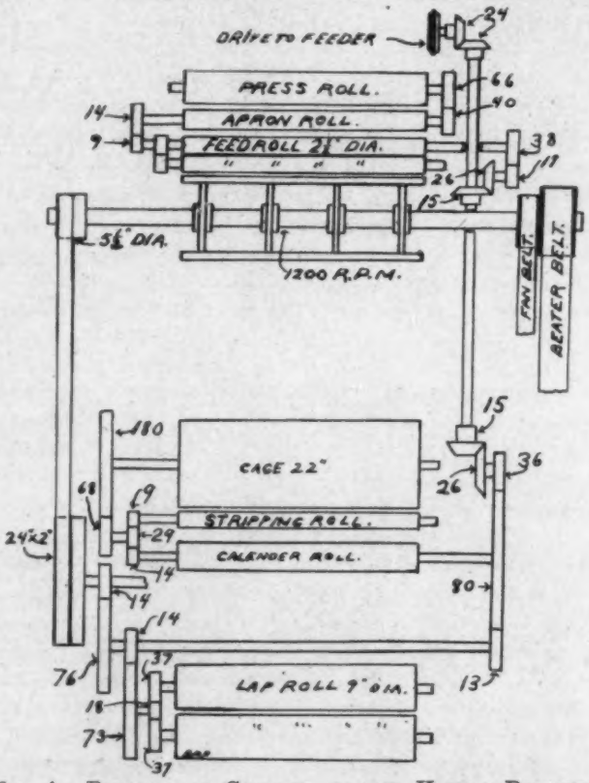


Fig. 4. Diagram of Gearing on the Kitson Breaker Picker.

as for the intermediate. To calculate the draft of the intermediate picker from the gearing shown in Fig. 5, using a 23 tooth draft gear, start with the 9 inch lap roll placing it above the line and proceeding as in the calculation at the breaker picker.

$$\frac{9x18x14x14x30x54x3.25x85x28x12}{37x73x76x23x40x10x1x20x16x2}=3.95 \text{ draft.}$$

To work out a draft factor, use the same figures as above, but leaving out the 23 tooth draft gear and substituting X in its place, as follows:

$$\frac{9x18x14x14x30x54x3.25x85x28x12}{37x73x76xXx40x10x1x20x16x2}=90.86$$

As the draft gear comes under the line, the draft factor 90.86, must be divided by the draft gear to obtain the draft.

90.86÷23=3.95 draft.

Now to find the correct gear to give any desired draft, divide the draft factor by the draft desired.

90.86÷3.95=23.1 or 23 tooth draft gear.

In all calculations in which the answer is the number of teeth in a gear, use a whole number as the final answer. A good rule to follow is to work out the answer to the first decimal, and if this fraction is less than .5, discard it, as in the above case; but increase the whole number by one in

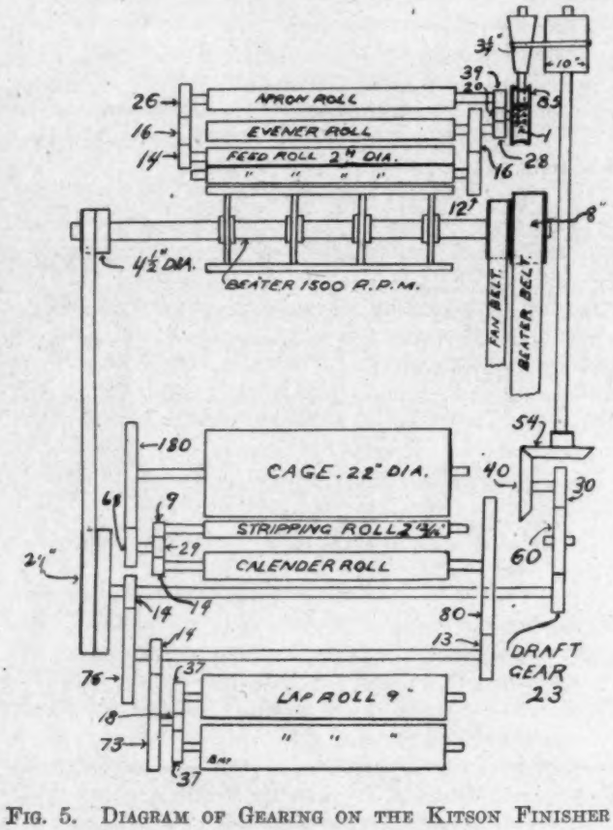


FIG. 5. DIAGRAM OF GEARING ON THE KITSON FINISHER PICKER.

case the fraction is .5 or over. If the answer of the above calculation had been 23.5, we would have given it as 24 teeth. For all practical purposes 91 can be used as the draft factor instead of 90.86, as the small amount of increase necessary to bring it to a whole number will not affect the results to any appreciable extent.

It will be noticed from Fig. 5, that any change in the size of the draft gear will effect the speed of the feed rolls only and will not alter the speed of the cages, lap or calender rolls. A larger draft gear will drive the feed rolls faster, and cause them to feed in more cotton, and thus lessen the draft. The largest portion of the draft on the pickers occurs between the feed rolls and the screens or cages, and any change in the total draft occurs between these two points. The drafts between the other intermediate points, such as cages to stripping rolls, stripping rolls to calender rolls, and calender rolls to lap rolls, are very small. These drafts are spoken of as tention and only serves the purpose of keeping the material tight as it is passed through the machine. Considering the cages as the delivery rolls, and working back to the feed rolls, using the same method as before, we get the following:

$$\frac{22x68x14x13x14x30x54x3.25x85x28x12}{180x29x80x76x23x40x10x1x20x16x2}=3.07 \text{ draft be-}$$

tween the cages and the feed rolls.

Not considering the tention draft between the different points, we can get the draft between the cages and the lap rolls by the following calculation:

$$\frac{9x18x14x80x29x180}{37x73x13x14x68x22}=1.29 \text{ draft.}$$

The product of these two intermediate drafts will be the total draft, thus:

3.07x1.29=3.96 total draft.

By similar figuring, it is possible to work out all the intermediate drafts or find the draft between any two points on the machine. In the above figuring, the cone or evener belt is considered to be working in the middle of the cones, as this is considered best by most carders. The diameter of the cone at this point is 3.25 inches. The numeral "1" in the calculation is the single worm on the end of the driving cone. Some carders prefer to run the cone belt about one-third the distance from the large end of the driving cone. In this case the diameter of the cone can be taken as 4. This would give a draft factor of 112, and a 23 tooth draft gear would give a draft of 4.87 instead of 3.95.

It is seldom necessary to change the draft gear on the pickers, because the cone drive to the feed rolls permits of such wide variations in draft, by simply moving the evener belt. The range of drafts used also is small, and any radical change desired in the weight of finished laps is usually made on the breaker picker.

In figuring the draft from the weight of cotton being fed into and delivered by the machine, the rule is: *Divide the weight going in at the back by the weight coming out at the front.*

Example. There are four laps on the apron of the picker, each weighing 14 ounces per yard. The lap delivered weighs 14.5 ounces per yard. What is the draft?

$$\frac{4x14}{14.5}=3.76 \text{ draft.}$$

Draft thus figured for the actual weights on the front and back of a machine, is spoken of as actual draft, and on every machine that produces waste, the actual draft is larger than the figured draft obtained from the gearing. In other words the actual draft is the ratio between the weights fed into the machine and the weights delivered from the machine. It takes into account any loss of cotton in the

form of waste that may occur between the feed and delivery rolls. Figured draft is the ratio between the surface speeds of the delivery roll and feed roll, and remains the same regardless of the amount of cotton lost in the form of waste.

On the pickers we can count on losing about 3 per cent. or more as waste of the total amount of cotton fed into the machine, depending upon the grade of cotton being handled and the cleanliness desired in the finished product. Now if the picker takes out 3 per cent. waste, the amount delivered from the machine will represent 97 per cent. of the amount fed into the machine. Then the amount going in at the back must be decreased by the amount of waste made, before we can figure the actual weight at the front.

To illustrate this point: If we figure the draft of the picker from the gearing to be 3.95, and there are 4 laps on the apron each weighing 16 ounces per yard, then the following should give the theoretical weight of lap at the front.

$$\frac{4 \times 16}{3.95} = 16.2 \text{ ounces per yard.}$$

Now to allow for the loss in weight, on account of the 3 per cent. waste taken out, we must multiply the weight at the back by .97, and then find what the weight on the front will be:

$$\frac{16 \times 4 \times .97}{3.95} = 15.71 \text{ ounces per yard.}$$

The actual draft of the machine figured from the weight on the front and the back would be this:

$$\frac{16 \times 4}{15.71} = 4.07 \text{ draft.}$$

It will be seen from the above that using a 23 tooth gear which we have figured to give us a draft of 3.95 with 16 ounce laps on back and a loss of 3 per cent. waste, we would actually have a draft of 4.07 and the lap would weigh 15.71 ounces per yard instead of 16.2 ounces per yard. In actual practice this would not make any difference, as

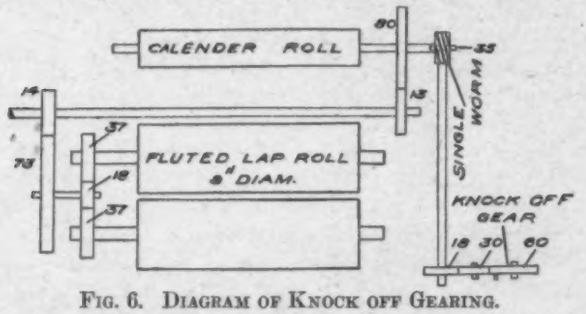


FIG. 6. DIAGRAM OF KNOCK OFF GEARING.

the correct weight of laps would be obtained by a slight change in position of the evener belt.

In the same way in finding the weight of laps on the apron of the picker from the weight at the front and the figured draft, we must allow for the loss of waste in order to be absolutely accurate.

Example: The weight of the lap at the front is 15.71 ounces per yard. The waste is 3 per cent. and the figured draft is 3.95. What is the weight of the lap at the back of the picker?

$$\frac{15.71 \times 3.95}{4 \times .97} = 16 \text{ ounces, weight of lap on apron.}$$

The principles underlying these two problems can be expressed in the following formulas, understanding that the draft used is the figured draft and not the actual draft.

To find the weight of the lap at the front:

$$\frac{\text{Wt. at back} \times \text{doublings} \times 1 \text{ less per cent. of waste}}{\text{draft.}}$$

To find the weight at the back:

$$\frac{\text{Wt. at front} \times \text{draft}}{\text{doubling} \times 1 \text{ less per cent. of waste.}}$$

The expression, 1 less per cent. of waste, is easily explained if we remember that the percentage of waste can be expressed decimally as well as the way given, as 3 per cent. can be expressed as .03 and will have the same value. Now the .97 used in working the two problems equals 1 minus .03 equals .97. If the machine makes 4 per cent. waste, we would use .96 in the formula.

SPEED.

The two-bladed beater usually revolves at 1,500 R. P. M. while the three-bladed beater is run at about 1,200 R. P. M. If the Kirschner carding beater is used, it should revolve at about 1,500 R. P. M. The fan runs from 900 to 1,050 R. P. M., depending upon the amount of waste desired. The speed of the lap rolls varies from 4.5 to 9 R. P. M. In getting the speed of any revolving part of the picker, it is well to bear in mind that the product of the driving pulley multiplied by its diameter, in every case would be equal to the product of the driven pulley multiplied by its diameter.

To find the speed of the beater shown in Fig. 5 when the main shaft speed is 325 R. P. M.: The pulley on the main shaft driving the picker being 28 inches in diameter; the pulley on the picker counter shaft being 18 inches in diameter; the large pulley on the counter which drives the beater being 24 inches; and the pulley on the beater shaft 8 inches in diameter.

Starting with the speed of the main shaft, we get the following:

$$\frac{325 \times 28 \times 24}{18 \times 8} = 1{,}516 \text{ R. P. M. of beater.}$$

This can be considered as 1,500 as the slippage in the belts is liable to bring it down to that figure.

The speed of the fan can be obtained as follows: The fan pulley is 8 inches in diameter and the pulley on the beater shaft driving the fan is five inches in diameter.

$$\frac{1{,}500 \times 5}{8} = 937.5 \text{ R. P. M. of fan.}$$

In figuring the speed of the lap rolls, we must start with the 4½ inch pulley at the end of the beater shaft. This is called the speed pulley, and the size of this pulley controls the production of the picker. Changing the size of this pulley changes the speed of every part of the machine, except the beater and fan. A larger pulley drives the machine faster, thus increasing the production.

The following calculation will give the speed of the lap rolls:

$$\frac{1500 \times 4.5 \times 14 \times 14 \times 18}{24 \times 76 \times 73 \times 37} = 4.83 \text{ R. P. M.}$$

In the above calculation, the diameter of the pulley and the teeth in the gears are used together in the same calculation, as in either case they are used to express the relation between the different parts being considered and it makes no difference whether this relation is expressed in diameters or teeth.

LENGTH OF LAP.

The total weight of the finished lap is governed by the number of yards it contains. It is measured by the revolutions of the lap rolls, the picker automatically stopping after the required number of yards are wound. The regulating device is called the knock-off, a plan of the gearing of same being shown in Fig. 6. The knock-off on a lap gear makes 1 revolution for each lap wound. Thus any change made in the size of the knock-off gear will give a corresponding change in the number of yards in the lap; a larger gear will give more yards in the lap, a smaller gear less.

The lap rolls are 9 inches in diameter or 28.27 inches in circumference and will have to make 1.27 revolutions to wind up one yard of lap. Now if we start with the one revolution of the knock-off gear, while the lap is forming, and figure around to the 9 inch lap roll, see Fig. 6, we would get the number of revolutions of the lap roll while the lap is forming. Then, as the lap roll has to make 1.27 revolutions to wind one yard, if we divide this by 1.27 we would get the number of yards in the lap, as follows:

$$\frac{1x60x35x80x14x18}{18x\ 1x13x73x37x1.27} = 52.74 \text{ yards in lap.}$$

We can get the knock-off constant by the same method as above, by simply leaving out the knock-off gear, thus:

$$\frac{1xXx35x80x14x18}{18x\ 1x13x73x37x1.27} = .879 \text{ constant.}$$

The change gear appears above the line in this case, and the factor must be multiplied by the gear to get the number of yards per lap, thus:

$.879x60 = 52.74$ yards in lap.

To find the number of teeth in the knock-off gear to give any desired number of yards in the lap: *Divide the number of yards in the lap by the knock-off factor.*

$52.74 \div .879 = 60$ teeth in knock-off gear.

(*To be Continued.*)

A new move is about to be made in the introduction of woolen clothing for the modern drilled army of China, and this may possibly prove the first step toward the more general adoption of woolen clothing throughout the country, a result which followed the same action in Japan. Two Chinese woolen factories have been recently established, which will deal with the requirements of the army board for woolen clothing. One is at Shanghai, a large building fitted with up-to-date Belgian machinery and employing at present several Belgian operatives to teach the Chinese students. The other was established in 1908 at Chingho, about 6 miles from Peking. It is well equipped with British machinery and employs three or four British operatives. If the civilians of China show any inclination to follow the lead of the army in wearing wool, there is little doubt that the number of such factories will increase. It is perhaps too early to predict an opening in this connection for tops, but it must be remembered that a demand for tops followed close on the establishment of woolen manufactories in Japan.

THE PRELIMINARY PROCESSES OF COTTON MANUFACTURING.

THE COTTON GIN—COTTON MIXING—PICKER ROOM.

(*Contributed exclusively to* COTTON)

BY WM. H. DOOLEY.

THE COTTON GIN.

The cotton gin is the first machine through which cotton passes, and is the process which separates the fiber from the seed. The seed may be estimated as about two-thirds the amount of cotton in weight. Seed-crushing has now become quite an important industry, with the cotton crop each year amounting to between 12,000,000 and 13,000,000 bales of 450 pounds per bale. There are valuable by-products obtained from the seed, including cotton-seed oil, stock feed, etc.

There are several different types of cotton gins. The saw or Whitney gin is the one most used in this country. It consists of 40 or 50 circular saws, mounted upon a revolving shaft. Above these is an inclined grid which forms the bottom of a hopper into which the seed cotton is placed; the teeth of the saws project through the bars of the grid and catch the fibers, drawing them away from the seeds, which, being too large to pass through, roll down and out of the machine. A revolving brush keeps the saws clean. This machine is responsible for much of the "nep" found in American cotton, which is caused by the fact that the machine is overcharged, and the result is a buckling over of the saws. The Whitney gin will turn through more weight of cotton than any other type of machine, and will clean from 200 to 300 pounds per hour. When the machine is running at high speed, the tendency is to string and knot the cotton.

The Macarthy gin in its original and simplest form consists of a leather roller and two steel blades, one of which is pressed tightly against the revolving roller. The fiber is drawn in by the rough surface of the roller (which is covered with walrus leather), and as it revolves, the lint is stripped from the seed. To assist in the detachment of the seed from the fiber, the second blade is adjusted a little in front of the fixed one, and by means of its rapid vibratory motion the seed is struck from the fiber. This machine is also provided with a grid upon which the seed cotton is placed, the bars being so arranged that the seed can not pass through them till it has been stripped of all its fiber. There are many varieties of the Macarthy gin,—all constructed upon the same principle, but differing in detail. The Macarthy double-roller gin has, as its name implies, two rollers instead of one, the feeding hopper being between the two. These gins are best suited for long-staple cottons, though they will do good work with short-staple varieties. There is also a double-action knife-roller gin in which the good points of the Macarthy and saw gins are said to be combined; in cleanness of work and avoidance of injury to the staple.

The methods now in vogue at the different gin houses are against a regular and uniform quality of cotton being maintained. When it is being made up into bales it is subjected to a hydraulic pressure of about 1,000 tons. The tare and bands are then placed around the bales for convenience and protection during transit.

COTTON MIXING.

Preliminary to mixing cotton, the fibers should be allowed to stand for a few days in a loose condition, which permits them to be opened more easily by the machines; also to allow excessive moisture to evaporate before passing the cotton through the machines. It is of vital importance that good judgment be exercised when selecting cotton for mixing. In sampling the bales, the most important points to be considered are the length, strength and regularity of the staple. One defect, resulting from working cottons together having different lengths of staple, would easily be discernible when spun into yarn, owing to the fact that the short fibers would not have the same grip around those of greater length; the yarn would be what is commercially known as "oozy," because the short fibers, not having twisted themselves uniformly with the long staple, would give the thread a ragged appearance.

One of the objects of carding and combing is to separate the short from the long fiber. When blending cotton there are other characteristics of the fiber to be considered in addition to the length of staple. For example, two cottons like rough Peruvian and Orleans, although the same length of staple may be obtained from these two varieties, are unsuitable for working together, owing to the fact that one has a harsh and wiry fiber, while the other is of a soft and pliable nature. A strong, wiry cotton is the most suitable for a warp mixing; but a soft, pliable cotton is preferable for weft. It is advisable, always, to make a mixing as large as possible in order to obtain a more even running yarn. It is also advisable to maintain in a mixing room a temperature of from 70 degrees to 75 degrees Fahrenheit. This condition will be found to give good results, as the fiber will retain only a normal supply of moisture after being opened and allowed to stand for a few days in a room having the above-mentioned temperature.

If convenient, it is well to have one mixing always made up so that one may be used while another is being mixed. The size of the mixing will, of course, be governed by the requirements of the mill; but the bales mixed at one time should be of such a number that the cotton could be allowed to stand for three days before being passed through the machines. In case a stack is made, the cotton should be taken from the sides, from top to bottom. This is necessary in order to get a thorough blending of the different layers. The blending of colors may be done at different stages of the working processes, namely, in the mixing room, at the intermediate picker, finisher picker or drawing frame. Colors are also blended in the creels of fly frames, where there is a doubling of two ends running into one. The method generally adopted is that of blending at the picker machine.

PICKER ROOM.

The proper regulation of the air current in a picker machine is of great importance, as so much depends upon this in the making of even and uniform laps. Defective air currents are the cause of lap-licking or split-laps cotton when a lap is being fed to the picker or card, and results in an uneven sheet because of the thick parts passing along with one layer, while the thin parts pass in at the feed with another layer. Unless there is an excessive amount of waste mixed in with the cotton, it is usually found that the air current is responsible, either directly or indirectly. In connection with this it may be noted that the flue arrangement should be so constructed as to allow a free passage of air by having all the elbows with good curves, and a discharge flue which is a little larger in area than the combined area of the flues entering into it, and free from back draft.

Providing the above conditions are satisfactory, the next resort may be to the division of the cotton on the screens, and for this purpose the majority of pickers are provided with dampers in the dust flues, by means of which a great portion of cotton can be conducted to either one of the screens. In connection with the regulation of the air current it should be noted that the screens and parts connected to them should be kept free from dust and fly, as this causes uneven laps, with ragged and uneven edges. Soft laps is a term applied to laps that are not hard, or sufficiently condensed when completed as delivered from the picker machine. The chief cause of this defect may be located in the friction which holds the racks upon the top roll. For instance, in some cases the leather becomes saturated with oil, or may be worn to such an extent that it does not offer sufficient resistance to the pulley, which permits the racks to be raised too early. This may be remedied, in some cases, by moving the weight on the friction lever so as to give more pressure against the pulley.

Laps being larger on one end than on the other, or what are known as conical laps, are caused in some cases by the fact that the racks, which bear upon the lap roll, are out of line with each other. These racks should be set in such a manner that each one will exert an equal pressure on the slip (or lap) roll. Again, the air current may be obstructed by cotton or fly clinging to the screens. It is necessary to keep the screens perfectly clean, so that the cotton is not drawn to one side more than to the other. Dirty laps is the term used in referring to laps which contain too much leaf, sand, etc., and any of the following conditions may be the cause; the beater may be revolving too slowly, the grid bars may be too close, or the air current may be too strong. If too much good cotton is found among the droppings, the reverse of the above conditions may be the cause of this.

The first machine in the picker room is the cotton opener, attached to which is the automatic feed and hopper. The cotton is first put into the hopper by the attendant, and is then taken up by a traveling, inclined spiked lattice or lifting apron; at the top of this lifting apron is a rotating spiked roll which beats off the surplus cotton carried up by the lifting apron, the distance between the two being regulated according to the requirements of feed. Another roll, covered with strong ribs of leather and set a little over the center of the lifting apron, beats the cotton off from the apron, causing it to fall upon a short, revolving lattice, which in turn delivers the cotton to the action of the beater.

Owing to the mode of equipment of some cotton mills, it becomes necessary to convey the cotton, as delivered from the opener, to rooms above the one containing the mixing and opener machine. This is done by conveying the cotton from the opener to the breaker machine by means of suction through trunks or conveying pipes. This suction or air current is created by the action of a fan connected with the breaker picker; the speed of this fan is governed by the bulk of cotton and the distance that it has to be conveyed, and ranges from 1,400 to 1,800 R. P. M. The cotton after passing through these pipes falls upon a re-

volving lattice, and is in turn presented to the action of the feed roll and beater of the breaker picker, and for the first time is spread upon a screen by means of air currents and by which it takes its first form of a lap.

The speed of the beater depends upon the stock being used and the style of the beater. There are two kinds, namely: Two and three bladed beaters. The preference is largely a matter of custom, as good results are obtained by either style. The speed of a two-bladed beater may be taken as follows: For short-staple cotton, about 1,500 R. P. M.; for medium cotton, 1,200 to 1,400 R. P. M.; and for long-staple cotton, 800 to 1,100 R. P. M. The speed of a three-bladed beater would be a little less than the above, according to the conditions.

In the setting of the beater to the feed rolls the distance between the two is governed by the class of cotton and the bulk of cotton being fed. For short-staple cotton, the distance is from about 1/8 to 3/16 of an inch; for the average American cotton, from 3/16 to 1/4 of an inch; for Egyptian, 1/4 to 5/16 of an inch; and for Sea-Island, from 5/16 to 3/8 of an inch.

The position of the grid bars in relation to the path of the beater is such that the bars near the feed roll are closer to the beater than the bars farthest from the feed rolls; for instance, the grid bars immediately below the feed rolls may be from 3/8 to 5/8 of an inch from the beater; again, the space between the bars may vary from 3/8 to 1/2 an inch between the upper bars and from 1/8 to 3/8 of an inch between the lower bars.

SETTING THE HARNESS.

BY EARNEST WHITWORTH.

This subject is usually not given the thoughtful consideration it deserves, perhaps because its value is not realized. A few notes regarding it may not be amiss. When a warp is being hung in a loom it is well to bear in mind that it is for the best interests of the loom fixer, as well as of the weaver and manufacturer, to set the harnesses into position correctly if only for the peace of mind which smooth running work brings. Assuming that

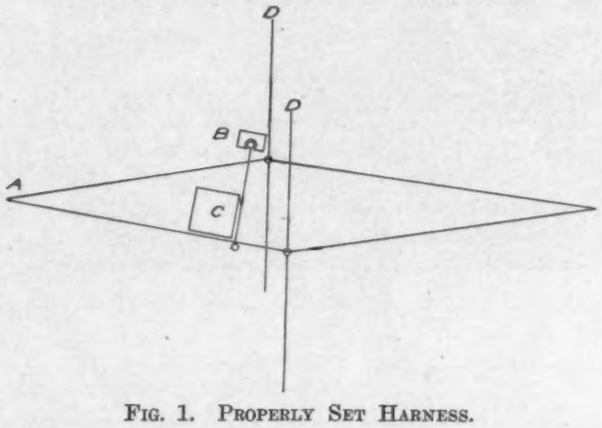


FIG. 1. PROPERLY SET HARNESS.

the lay cap is in correct position, parallel with the race plate, the harnesses should be hung in the same plane, and timed so that the lower shed will just clear the race plate, no matter which harnesses are down, when the shed is fully open. As there is a greater strain on the warp yarn when the shed is open than when it is closed it is as well to keep the shed as small as possible without allowing the yarn to be chafed or broken by the shuttle.

The nearer the harnesses are to the lay cap the smaller need be the shed. This may be seen by comparing Figs. 1 and 2, where A represents the fell of the cloth, B the lay cap, C the shuttle, and D the harnesses. The lay cap is represented at the back position, and the shed the same depth immediately in front of the reed, in each illustration. The shed should be just large enough to admit of the passage of the shuttle freely. If too small there will be chafed and broken ends, shuttles skipping or being thrown out, or the loom banging off due to the shuttle not reaching the box in time. Particular attention should be paid to the under connections in order that one side of the harnesses will not be higher or lower than the other, and that they will work steadily without any side motion. If the bottom line of the shed, beds or rests on the race plate at any time the warp yarn will be chafed or broken, especially so if the race plate is of iron. If the race plate is of wood it will soon get worn into little grooves by the yarn, and thereafter be a constant source of trouble.

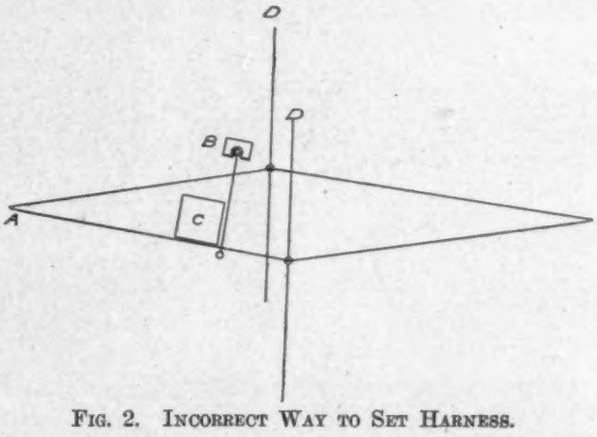


FIG. 2. INCORRECT WAY TO SET HARNESS.

If the bottom line of the shed is too high, chafed and broken yarn will result; there is also the additional danger of the shuttle being raised as it enters the shed, and either thrown out of the loom or into the receiving box in an unsteady manner. For certain classes of goods the yarn in the upper and lower part of the shed are made to be at an equal tension when the shed is fully open. For other goods, where cover is desired, the yarn in the top shed is allowed to be slacker than that in the lower. Care should be taken not to allow the yarn to be too slack or it will impede the shuttle as it goes through the shed. Broken ends mean poor quality of cloth as well as loss of production, as it is practically impossible to prevent weaving a greater or less length of cloth after the ends break unless there is a warp stop motion on the loom. The question of timing the harnesses in relation to the movement of the lay and to the passage of the shuttle is also of importance, but its consideration here is outside the scope of this article.

Consular Agent George C. Carothers, of Torreon, reports that a large cotton compress has been erected for the Laguna district of Mexico, and next season's crop will all be compressed there into round bales. The railroads will only haul cotton that has been compressed. The farmers think there will be plenty of water for the next crop, as the season starts out the same as other wet years.

KNITTING

KNITTING YARNS.

THE MATERALS USED.—MIXTURES.—THE STRUCTURE OF THE YARNS.

(*Contributed Exclusively to* COTTON.)

BY WILLIAM DAVIS, M. A., PRINCIPAL OF HAWICK TECHNICAL INSTITUTE.

In considering the nature of yarns used in the knitting industry, one must have a clear idea of what is generally required for knitted fabrics. The branches of the knitting industry are many and varied, yet there are certain qualities and characteristics common to all. One of the first requirements of such a yarn is that it shall be soft and yielding. In no branch of textiles do we find these qualities so all important. The garment is usually worn in close proximity to the skin and if the material is harsh, constant irritation is caused. There are various ways of attaining this end, the most important of which being the choice of materials of a specially soft character. Thus lamb's wool finds an extensive use in underwear.

Lamb's wool is the first clip from the animal and is thus fine in fiber and soft in handle. As the sheep turns older the wool becomes thicker and coarser and tends to lose its vitality. The lamb's wool fiber tapers to a point and the scale structure is not so clearly marked as in the later growths. There is thus, not the same tendency to felt, a matter of prime importance in hosiery goods Employ a readily felting material and the article will suffer considerably in size and shape after a few washes.

The merino wool has a short fine staple and the fibers are densely packed together on the fleece. The material is soft and springy and thus is widely employed for the best qualities of knitted goods. One great drawback is its ready capacity for shrinking or felting. To reduce this, the pure fiber is frequently mixed with the non-felting material cotton, fiber for fiber, so that the wool strands are to some extent kept separate from each other and felting reduced. On the other hand, merino fiber is finer than any other class and it approaches nearest the cotton fiber in diameter, a matter of first importance in blending textile materials. If the constituents of a blend differ greatly in diameter, a satisfactory thread cannot be produced, for they cannot be successfully manipulated in carding and spinning. Other well known types of hosiery wools are South Down and Puntas Arenas, the latter being remarkable for its bulky handle.

The requirements of the hosiery fabric are admirably fulfilled in the Shetland wool. This material possesses a most agreeable handle and is soft and elastic. It further possesses a natural tinge peculiar to itself on account of which the term is employed in two ways, one to mean the material and another to designate fabrics made in the Shetland color only. The latter class is usually a low grade yarn where exists great facility for the introduction of coarse fibers of little value. Fig. 2 shows a yarn of this type where one can distinguish the coarse fibers by their greater diameter.

It is because of their softness that materials of the goat and camel sheep class are so largely used in knitted cloths. Such materials frequently possess a natural coloring pigment of their own, a quality valued by the manufacturer of such goods. Although the fiber may be fine and the staple long, the surface serrations are not so distinct as in sheep wool, so that the tendency to felt is not so great. In the front rank of this class stands the product of the well known Cashmere goat, a native of the Himalaya mountains in the north of India. It is found in white and some natural tints of light brown. In delicious handle and silky softness, it stands unsurpassed. But nature never allows its finest products to remain unprotected and wherever you find a material of rare qualities, there also exists some form of efficient protection from the outside world. In the Cashmere fleece this takes the form of long beard hairs which make up the exterior portion exposed to the weather conditions.

Some idea of the difference in diameter between the beard hairs and those of the under portions may be gleaned by an examination of Fig. 3. The two coarse straight fibers in the center show up in strong contrast to the surrounding fibers of fine diameter. For the manufacture of the best classes of goods, these coarse hairs are extracted and only the finer qualities spun, a circumstance which accounts for the high price of Cashmere.

Illustration 4 shows a single yarn consisting of both fine and coarse fibers, whilst illustration 5 shows a high-priced Cashmere thread spun from the fine fibers only. Gloves, scarfs and shawls are most frequently made from pure Cashmere. These are articles which are subjected to a considerable amount of handling, so that the delicate qualities of the material are ever in evidence to the sense of touch.

Camel hair is frequently made use of for knitted goods, this fiber having likewise coarse and fine varieties and a natural yellow tinge. It is most useful for wraps and rugs. The material is neither so soft as Cashmere, nor so elastic. Alpaca from the South American goat of the same name is found in various shades and has a limited use in this industry.

PERVERSION OF TRADE TERMS.

Nowhere do we find perversion of trade terms so universally practiced as in the hosiery industry. Most of the terms just mentioned have been perverted in their application, till now they have a much wider meaning than formerly. This has most always shown a downward tendency, that is, the term has been made to embrace materials of a cheaper and lower quality. The name of the real article has been assumed by its imitator. Thus in the knitting industry, merino as applied to yarns, no longer means the pure fine fiber, but includes the cotton and wool yarns so largely worked. Lamb's wool originally meant that such goods have been manufactured from the soft and warm material which characterizes the first clip from the sheep, but may now include materials of a cheaper character. The term Shetland is applied to articles where only one of the qualities of real Shetland is professed, that of color. Cashmere is used to denote all combed yarns used in the hosiery industry.

Next to choice of material, there are mechanical means of attaining the necessary softness and fullness of handle

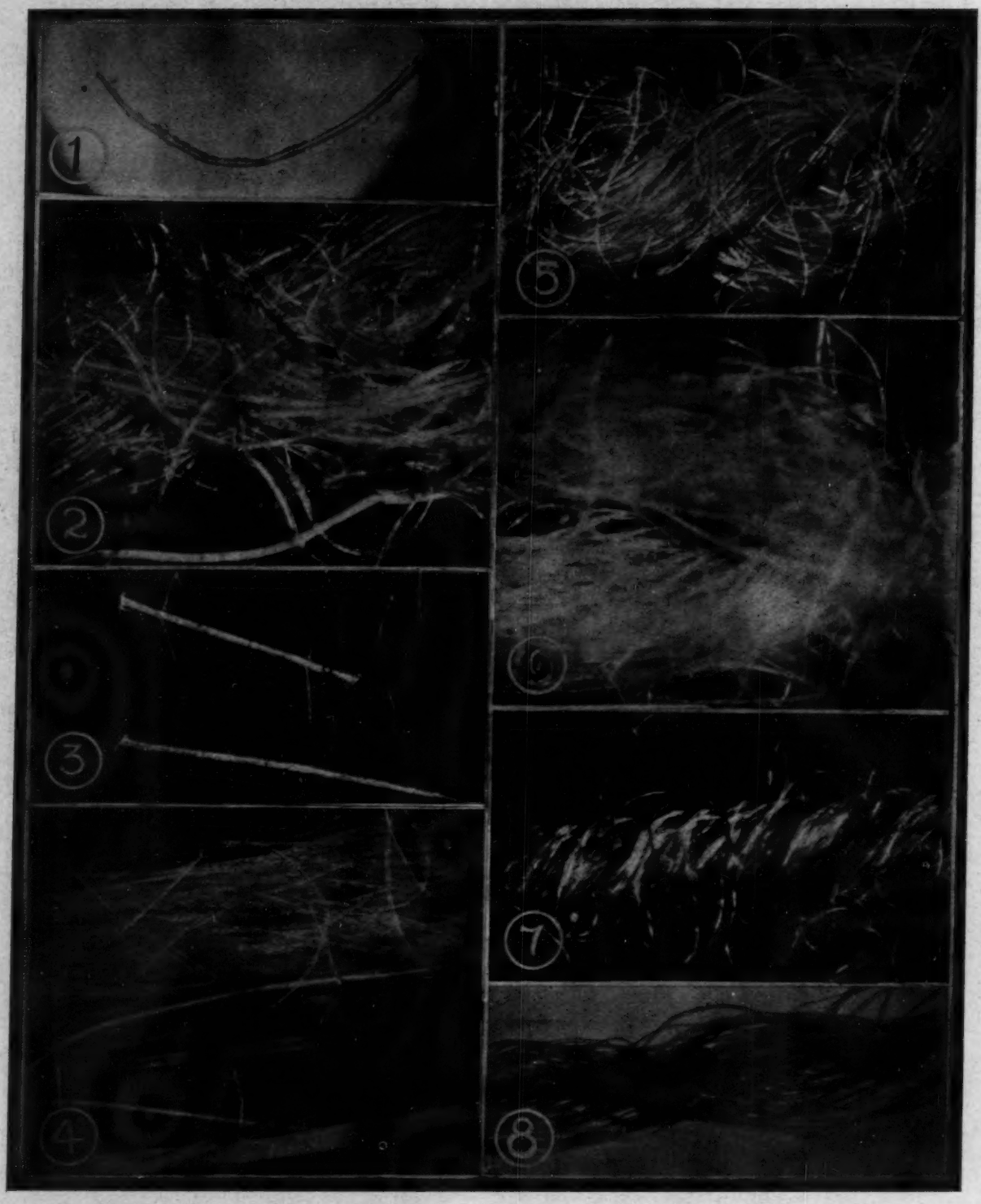


Fig. 1. Fiber of Lamb's Wool Showing Tapering Tip. Fig. 2. Coarse Shetland Yarn, Showing Fibers of Unequal Diameter. Fig. 3. Contrast Between Fine and Coarse Beard Hairs in a Cashmere Fleece. Fig. 4. Single Cashmere Yarn Where Coarse and Fine Hairs are Spun Together. Fig. 5. Pure Cashmere Two-Fold Knitting Yarn. Fine Hairs Only. Fig. 6. Two-Ply Coarse "Wheeling" Yarn. Fig. 7. Saxony Woolen Yarn as Used in the Weaving Industry. Fig. 8. Worsted Weaving Yarn. With the Exception of Fig. 1, These are Micro-Photographs, Magnified From 40 to 50 Diameters.

combined with a high degree of elasticity. A yarn of full handle is necessary because of the nature of the knitted loop. In itself, it tends to be open and show innumerable interstices, so that a full round yarn is required to fill out these spaces. Further we require an elastic yarn because of the strain to which the yarn is subjected during knitting. In weaving, the pull is exerted on the thread extending over a length of some inches, but in knitting, the yarn is subjected to a series of strains at every point over its whole length. A yarn defective in elasticity and yield thus fares

badly in a hosiery frame. Next to the material itself, it is to the preparatory processes of carding, combing and spinning that we must look to attain the desired results.

WOOLEN AND WORSTED HOSIERY YARNS.

In the weaving industry we recognize the two great divisions, woolen and worsted. By the former we understand those threads spun from carded wool, that is the fibers have been made to cross and overlap in every possible direction and the fibers both long and short utilized indiscriminately. The worsted thread is obtained from the longer of the fibers, arranged as far as possible parallel to each other, the shorter fibers having been removed.

In knitting yarns we also recognize a distinction of this sort, only the lines of division are not so clearly defined. This is probably due to the fact that the worsted yarn as employed in the weaving trade is in general too hard and bald in appearance to be suitable for hosiery. In its place, we find a quasi worsted yarn, where the fibers have been combed, but still retain the fibers both long and short.

Another feature of hosiery yarns both woolen and worsted is that they are in general less tightly spun than weaving yarns. For this reason hosiery yarns are seldom spun on the ring spinning frame, but on the mule where a softer twist can be imparted. To correspond with the woolen and worsted divisions we have the primitive terms "wheeling" and "fingering" yarns, which were given in the days of domestic spinning on the wheel.

The mode of designation of such yarns more or less persists today and many yarns are known as two, three or four-ply without any indication of the actual counts of the single thread. The wheeling yarn is a coarse woolen thread two or more fold made roughly on the wheel. An examination of Fig. 6 will show that there exists little order among the fibers and that such a yarn can only be used for the coarsest fabrics. Although coarse they are well known for excellent weaving qualities.

Figure 7 shows a saxony woolen yarn as used in the weaving trade and comparing it with Figs. 5 and 6 as to general appearance, one can see that the fibers are more closely twisted together than is the case with the hosiery woolen yarns. Figure 8 represents a typical weaving worsted yarn where the fibers are seen to be close together and very parallel. Figure 9 shows a similar worsted yarn as adapted to the knitting industry and it will be seen that it is much opener in structure and has much short loose fiber projecting from its surface. In the weaving yarn of Figure 8 these surface fibers are not in evidence, having been removed in the combing machine. Figure 10 is a photo of a typical "fingering" worsted hosiery yarn, three-ply. It is very compact in structure and finds a large use in the manufacture of garments for outer wear. Although a worsted yarn, one can notice that the fibers are not extremely parallel and that considerable short surface material is present.

Another material largely employed in high-class knitted goods is spun silk. In its pure form the silk thread is not large enough in diameter to make a satisfactory article entire. One device is to use a splicing arrangement and lay the silk on the surface of the fabric and woolen or other material of greater bulk on the back. Another very popular method is to introduce the silk as a silk and wool twist. Fig. 11 illustrates one variety, where the spun silk yarn is seen to cross a woolen thread of much greater diameter. Fig. 12 shows another example where a much finer count is employed for the woolen thread, in this example also, the loose manner in which the two yarns are twisted is very noticeable. Fig 13 illustrates the appear-

Fig. 9. Fine Worsted Knitting Yarn.
Fig. 10. Three-Ply Hosiery "Fingering" Yarn.
Fig. 11. Silk and Wool Hosiery Yarn, Coarse Counts.
Fig. 12. Silk and Wool Knitting Yarn, Finer Counts. Note Slack Twist.
Fig. 13. Cotton and Wool "Merino" Hosiery Yarn. Magnified From 40 to 50 Diameters.

ance of the so-called "merino" yarn composed of cotton and wool mixed in the fiber. One is struck by its bald appearance and the cotton fibers can be readily distinguished by the straight and abrupt manner in which they project from the thread, whilst a closer examination will reveal the spiral twist characteristic of cotton. As before, these threads are very loosely twisted.

THE MANUFACTURE OF FULL-FASHIONED SWEATERS.

BY H. K.

The popularity of the coat sweater is on the increase and this fact has enticed many manufacturers to enter this branch of the knitting industry. Sweaters are made in an endless variety of designs and fabrics. The lower grade of sweaters are produced on circular machines which may have automatic changing devices for changing the stitch. The fabric thus produced being afterward cut to the shape required, the finish of the garment depending on the skill of the sewing machinist. The full fashioned sweater is found in the high grade qualities of these garments. The small production and the greater detail required for their manufacture are the strongest objections against the manufacture of this type of sweater. However there is no denying the fact that the best fitting sweater is full fashioned. The various parts, of which the complete garment is formed, are fashioned to shape on the machine and when put together have that smart fitting appearance which only full fashioned garments have.

A large number of manufacturers do not favor the fashioned garment, what they want is production, and this they get at a sacrifice in appearance of the finished product. A manufacturer, who makes a full fashioned sweater of high grade that is recognized as such, has reached that enviable position by keen and careful attention to all the details of the manufacture of his product. He it is who in the first place must draft out the style and instructions for the sweater to be knitted. The operators on this class of work should be intelligent and pay careful attention to the instructions laid out for them. Before we can start to make any particular style of sweater, we must have the design laid out on paper. Having the design mapped out and the sizes all proportioned, we draft out the instruction for the knitter. A knitted fabric is very elastic and this factor has to be considered in laying out the pattern and due allowance made for this elasticity.

The popular stitch used, especially for ladies sweaters, is the full cardigan and half cardigan. These stitches are sometimes called polka and royal rib respectively, and are the fundamental stitches for all fancy knit fabrics used in sweaters, mufflers, caps, etc. By various arrangements of the needles and with the addition of a shogging device which changes the position of the back or front needle bed over one, two, or more needle spaces, an almost unlimited variety of stitches can be made. The hand flat machine using latch needles provides us with the necessary machine on which these garments can be made.

To make out the instructions for the knitter from the pattern which has been laid out on paper, we must first of all knit a piece of fabric about six inches square. Using this as a basis we count the number of courses and number of needles in one square inch. From this data we can make out the knitting draft. The sample fabric we find has 10 courses and 5 needles in one square inch. Figs. 1, 2, and 3, illustrate the back, front and sleeve of a ladies sweater. The complete garment consisting of back, two fronts, two sleeves, two cuffs, belt, and the binding for the face of the fronts.

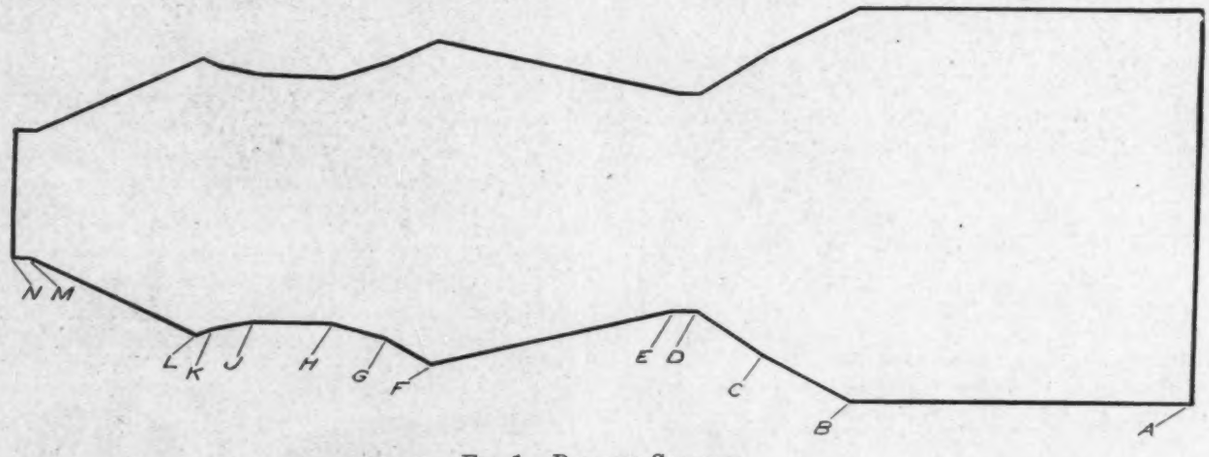


FIG. 1. BACK OF SWEATER.

The garment as illustrated in Fig. 4, is made on a machine with 5 needles per inch, needle beds 18 inches wide and equipped with cardigan cams and a shogging device. The size of the yarn used being 3-16s worsted and spun on the French system. Yarns spun on this system are softer and more elastic. The stitch used is full cardigan and the garment we will consider is of medium size. Fig. 1 is the back of the garment and is started at A. on 62 needles.

From A to B we knit 92 rounds. A round equals the travel of the carriage across the needle bed and back again to the starting position.

From B to C we narrow the fabric on both sides, using a three point narowing comb, six needles by four rounds, that is we narrow one needle after knitting four rounds and repeat this until we have narrowed the six needles. By using the narrowing comb the loops on the three end needles are transferred one needle inward this giving us a double loop on the third needle from the end. This narrowing is done at the remaining three corners of the machine.

From C to D narrow 6 needles and 3 rounds between

each narrowing.

From D to E knit 6 rounds, this is the waist line of the garment.

From E to F widen 7 needles and 8 rounds between each widening. The widening is done by raising the needles into operation and they will pick up their own loop.

From F to G narrow 3 needles and 4 rounds between each narrowing.

From G to H narrow 2 needles and 7 rounds between each narrowing.

H to J knit 21 rounds.

J to K widen 1 needle andd knit 12 rounds.

K to L widen 1 needle and knit 4 rounds.

L to M narrow 11 needles and 4 rounds between each narrowing.

After knitting several extra courses which the loopers unravel the back of the garment is complete.

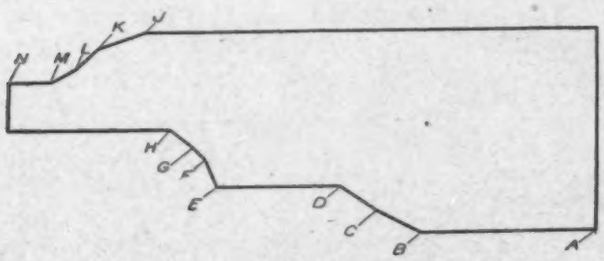


Fig. 2. Front of Sweater.

Starting at A Fig. 2 with 62 needles knit 92 rounds.

From B to C narrow 6 needles and 4 rounds between each narrowing, which is done on the left side only.

From C to D narrow 6 needles and 3 rounds between each narrowing.

From D to E knit 88 rounds.

From E to F narrow 7 needles and 1 round between each narrowing.

From F to G narrow 3 needles and 2 rounds between each narrowing.

From G to H narrow 4 needles and 3 rounds between each narrowing.

From H to J knit 15 rounds.

From J to K narrow 5 needles and 5 rounds between each narrowing.

From K to L narrow 6 needles and 2 rounds between each narrowing.

From L to M narrow 3 needles and 4 rounds between each narrowing.

From M to N knit 18 rounds and this completes the knitting of one of the fronts. For the other front the narrowings are done on the opposite side from the narrowings on the first front.

At Fig. 3 we start on 56 needles. From A to B we widen 12 needles and 12 rounds between each widening. This widening taking place on both sides of the fabric. The needles raised in widening will take their own loop, without having a loop transferred on to them.

At B cast off 4 needles at left.

From B to C narrow 6 needles and 1 round between each narrowing, left side.

From C to D narrow 2 needles and 2 rounds between each narrowing, left side.

From D to E narrow 3 needles and 3 rounds between each narrowing, left side.

From E to F narrow 2 needles and 6 rounds between each narrowing, both sides.

From F to G narrow 3 needles and 9 rounds between each narrowing, both sides.

From G to H narrow 7 needles and 3 rounds between each narrowing, both sides.

From H to J narrow 8 needles and 2 rounds between each narrowing, both sides.

From J to K narrow 10 needles and 1 round between each narrowing, both sides.

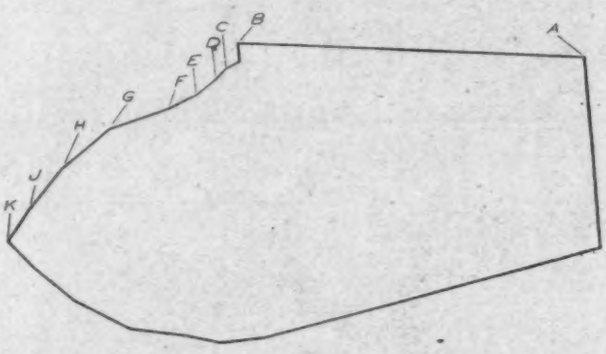


Fig. 3. Sleeve of Sweater.

This completes the knitting of the sleeve and for the remaining sleeve we reverse the position of the narrowings. For the cuffs we start on 48 needles, full cardigan stitch, knit 45 rounds and shog every round. Change the stitch to plain rib and knit 30 rounds. The belt is knitted on

Fig. 4. The Full-Fashioned Sweater.

14 needles, stitch full cardigan, shogged every round and the desired length knitted. At the end of the belt we narrow down every round one needle until we have only one needle left and in this way cast it off.

Banding for the face of the fronts of the sweater may be started on 40 needles and using a plain rib stitch and shog every two rounds we knit the required length.

The various parts of the sweater being completed are now ready for the finishing. The fronts are looped to the back across the shoulder. The sleeves come next in order, the starting point of the sleeve comes at F on the front. The top point of the sleeve should come exactly at the top of the shoulder. Care must be exercised in this operation so that the proper fullness is given to the sleeve. The cuffs are also looped on at this time. This finishes the looping operation.

The seaming of the various parts now take place on an overstitch machine. This includes the seaming of the sleeves, the fronts to the back and the banding to the face of the fronts. A hem of one-half inch may be made along the skirt of the sweater and this may be done either by hand or machine. The buttonholes may be hand done or by machine. The garment is now passed to the inspectors and after being carefully examined is passed on to be pressed in a light steam press. These garments are kept clean throughout the various operations and are not scoured in the finished garment as this would tend to felt the fabric.

DYEING, BLEACHING AND FINISHING.

HARMONY AND CONTRAST OF COLOR.

INDIVIDUAL QUALITIES OF COLORS AND THE EFFECT OF ARTIFICIAL LIGHT ON COLORED TEXTILES.

BY DAVID PATERSON, F. R. S. E., F. C. S.

PART V.

HARMONIES OF ANALOGY.

In the course of these articles we have studied the harmony of contrast, with the effects of (1) simultaneous contrast, or the influence that one color has upon its immediate neighbor; and (2) of successive contrast, or the effect on a color's appearance when the eyes have been viewing another color immediately before. We have studied likewise the influence of contrast of tone in colors; the contrast of scale or gradation; and also the harmonious complementary hues, with all their tints, shades and broken tones. All this seems to be very complex at first; but the whole wide range of color harmony phenomena can be condensed into a simple and serviceable system, comprised of only two principal groups.

This excellent method of classification is based upon the now generally adopted arrangement of M. E. Chevreal, to whose classical researches on color harmony we are ever indebted. He it was who systematised, and put upon a thoroughly scientific basis all the perplexing phenomena of color contrast and harmony. All color harmonies he divided into two great groups, harmony of contrast and harmony of analogy. Under each of these groups were classed three divisions as in Fig. 1.

The first group we have studied in detail in former chapters, but for the sake of greater precision to the mind of the reader I here condense them in tabular form:

I.

(1) *Harmony of contrast of scale* is produced when we view two widely distant tones of a series or scale belonging to the same class.

(2) *Harmony of contrast of tone* is produced when we view several tones of different depths belonging to closely related scales. A light color and a dark color of somewhat similar hue placed side by side gives contrast of tone.

(3) *Harmony of contrast of hue* is produced when we view harmonious colors widely different from each other in hue.

II.

(1) *Harmony of analogy of scale* is found when we look at a finely graded series of colors. It is the harmony of gradation.

(2) *Harmony of analogy of tone* is produced when we view a few tones of the same or nearly the same depths, but belonging to slightly different scales. For example, several colors all much the same depth, and closely related in general aspect. This is apt to make rather an insipid coloring.

(3) *Harmony of analogy of hue.* This is what is generally termed a "dominent hue" harmony, which we discussed in the last article.

These two great groups, each with their three divisions, embrace, as far as a hard and fast system can, practically

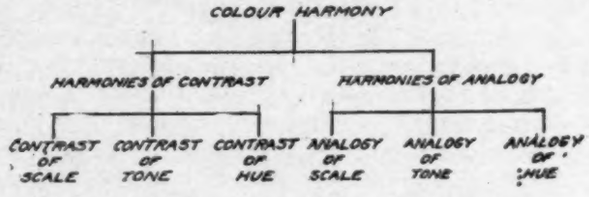


FIG. 1. ANALYSIS OF COLOR HARMONIES.

all the many complex effects of color influence in harmony. Much of the beauty of nature depends upon the harmony of analogy, where we see a series of shades gradually passing from one color into another by small steps or gradations. We see it in foliage, where the point of a leaf may have quite a different color from the end at the stem, as shown in Fig. 2; both colors yellow at one end and green at the other gradually merging into each other. The blending of the hues may be roughly divided as shown.

In rose leaves in the spring time may often be observed a gradual transition from red to green, passing through all hues of bronzy green and copper. The pleasurable emotion which arises when making this study is not from viewing color contrast, but color analogy. The beauty of flowers and stones; sea and sky; birds' plumage and moth's wings; all owe much of their charming beauty to this infinite gradation of one hue into another.

HARMONY OF THE DOMINANT HUE.

This is an important factor in securing good color effects. It produces the same pleasurable sensation as when we view a picture or landscape through a piece of colored

glass. The whole field of vision becomes strongly tinged with one predominating hue, viz., the color of the medium looked through. Where two harmonising colors are brought together in equal proportions in a color scheme—especially if they are bright colors—the combination will be found unsatisfactory. For example: Yellow and violet; orange and blue; or red and bluegreen, etc. There seems to be a want of artistic balance about them. Each color seems to strive for supremacy and the effect in viewing them is disturbing and unrestful. But if one of the colors be used in excess of the other; say a larger proportion of violet than yellow; of blue than orange; or of red than bluegreen; then the effect becomes more satisfactory and harmonious.

It is always well to bear in mind that there is much in color harmony that cannot be put down into cold matter of fact rules and scientific laws. "The eye is the proper judge of color harmonies, which are the results obtained by the exercise of judgment and feeling of the artist or decorator, and not by the strict observance of any rigid rules relating to the theory of chromatic equivalents. One color either in area, or intensity, ought to be in excess of any other color in a good composition. This will give piquancy and character to the whole arrangement and will relieve it from the commonplace monotony which is usually found in color schemes that are based on the optical balance of chromatic equivalents. It is, therefore, not necessary to aim for the maintenance of an optical equilibrium, or neutralization of color in pictorial, or in decorative work, in order to obtain harmony."*

SEPARATING LINES.

In all kinds of industrial art it is necessary to have in a series of analogous hues, a good decided step or gradation between them; otherwise they blend into each other too closely and do not give the effective appearance necessary for all color schemes in industrial art. For this purpose lines of white or black or grey are used with good effect in separating contiguous colors; all due consideration being given to the effect of the white, black or grey upon the hues so separated.

A few of the effects on colors thus divided are here given:

Red edged with white, becomes deeper and richer.

Red edged with black, becomes brighter and more orange.

Red edged with grey, becomes brighter and less full.

Orange edged with white, becomes deeper and looks redder.

Orange edged with black, becomes brighter.

Orange edged with grey, becomes deepened and enriched.

Yellow edged with white, becomes deeper and less bright.

Yellow edged with black, becomes paler and brighter.

Yellow edged with grey, becomes brighter and looks well.

Green edged with white, becomes deeper and purer.

Green edged with black, becomes brighter and paler.

Green edged with grey, becomes deeper.

Blue edged with white, becomes deeper and richer.

Blue edged with black, becomes more saturated.

Blue edged with grey, becomes purer and deeper.

Violet edged with white, becomes deeper and enriched.

Violet edged with black, becomes a little brighter and clearer.

Violet edged with grey, becomes clearer and enriched.

*"Color Harmony and Contrast," by James Ward, 1903.

INDIVIDUAL QUALITIES OF COLORS.

Red is a primary, or simple color in both the theories of color sensation. It is, perhaps, the most showy and gorgeous color of the whole spectrum. Because of its brilliancy it must be used with care in textiles, but it is the most useful and important color in textile design. The pure typical red is more of the crimson hue than is generally supposed. What is often represented as a red is really a scarlet or an orange red. When red is saddened with grey or black we get that invaluable class of shades like cardinal, cerise, claret, chocolate, dull reds and browns, maroons, and innumerable warm shades that are of great value in the textile arts. In dress goods a spot or two of red has a wonderful enlivening effect.

Orange is the intermediate hue between red on the one hand and yellow on the other. The yellower hues of orange, such as orange-yellow are the most brilliant and luminous of all the colors in the spectrum. The purest hue of orange is found in the skin of a good orange and may be seen also in the pigment known as cadmium yellow; when saddened with grey or black it gives beautiful warm shades of russet, brown, terra-cotta, bronze, old gold and brown olives, which are of immense service to the textile colorist.

Red and orange are termed advancing colors because they appear to stand out more than the colder class of shades. In making a good orange by mixing red and yellow together it is necessary to have a red that inclines to yellow, that is a scarlet red, otherwise a poor orange will result. For example, if we mix a crimson or a bluish red with yellow, we do not get a good orange because the blue present in the red goes to form a proportion of grey and this dulls the result. In the same way the yellow used must not be a greenish yellow, otherwise the same flattening or dulling effect is produced. When orange is reduced with white, beautiful tints of salmon, buff, ecru, cream, etc., are obtained.

Yellow is the most luminous color of the spectrum. It stands between the warm radiant red on the one hand and the cool retiring blue on the other. Its use in the textile arts is limited, because of its extreme vividness, but when used in small pieces, along with other suitable colors, it adds a freshness and lightness not obtained with any other color. It, like red and orange, is an advancing color, standing out from the others. In various styles of check patterns, such as travelling rugs, and in tartans, a yellow stripe is very effective. In fine shawl work, such as the example of Indian shawl given in the last chapter, an orange yellow is likewise most effective; but it is absolutely essential that it be used in small pieces. There is no color which so readily destroys harmony as yellow in large pieces. When mixed with grey and black it gives a large variety of olive green shades, citrine, sage, moss green, etc. Personally speaking, I think yellow is never seen to greater advantage in textiles than when in a Scotch tartan. No color is more charmingly in harmony with a pattern than the yellow stripe in a Stewart, a Malcolm, a MacNeil or a Cameron tartan. With their shades of dull green, and blue, black and red, it forms the exact color note required to complete the harmony.

Green in the pure state is little used in textiles because of its strong vivid hue, but when toned down into green sages, and dull mode greens it forms a most useful color. Pure green has to be used but sparingly in color schemes, because, although not particularly luminous, it yet creates a fatigue in the eye sooner than reds and blues. The viewing of soft tones of green is particularly pleasing and restful,

and in nature we find it the most widely distributed color. Its mental effect is soothing. If we take a blade of grass or a leaf, and compare its tone of green with our ordinary so called greens, we will be astonished to see how soft and subdued is nature's green compared with our crude harsh greens. In nature, pure green is only to be found in very rare and small pieces, in a humming bird or a parrot; a lizard, or some of these exquisitely beautiful little beetles.

The exact hue of fresh green grass is really a grey yellow-green. If we place a blade of grass on any of our ordinary commercial greens we will see that grass green looks a dull sage beside them. When green is saddened with grey or black we get a large and useful variety of soft beautiful shades much used in the textile arts, such as olive greens, myrtle greens, slate, moss, pine, and bronze greens, etc., when associated with warm shades of orange and red, fine harmonious contrasts can be made.

Blue. The standard of a pure blue is found in pure ultra marine (*lapis lazuli*), but, like pure green, it is seldom employed in textiles in its strong primary state, unless in small fancy spots. When shaded with grey or black it gives a wide range of most useful shades ranging from the beautiful Wedgewood blue and slate shades to deep navy or indigo blues. It is a cold retiring color and harmonizes well with all the warm hues. Red and blue in textiles impart a freshness and tone, and if they be harmoniously combined with green and orange, we obtain the standard coloring of the Turkey carpet, which has a remarkable quality of looking fresh after many years service.

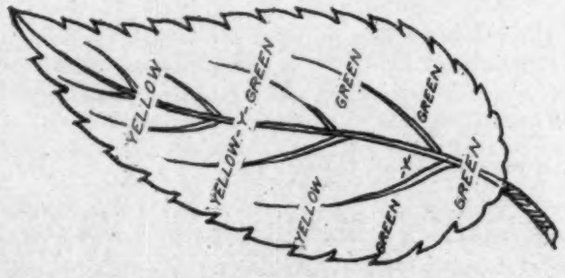


FIG. 2. HARMONY OF ANALOGY.

Violet and Purple. These colors lie between the red and the blue; the purple being the redder of the two. The great dividing line in the chromatic circle, dividing the warm hues from the cold, comes exactly between the violet and the purple, with the result that purple is classed as a warm hue while violet is a cold one. When reduced with white they give beautiful tones of delicate lavender and heliotrope, crushed strawberry, etc., and if broken with grey or black they give all the mode shades of plum, wine, dull purples, prune, cerise, violet blacks, etc. All such shades harmonize well with the yellows and yellow greens, citranes, olives or myrtle greens.

COLORS IN ARTIFICIAL LIGHT.

All colors change more or less in the various artificial lights, but the yellower the light, the greater the change in color appearance takes place. The change is due to the predominance of the red, orange and yellow rays in ordinary artificial lights; with a corresponding absence of the violet and blue rays. Under gas light, oil lamp and candle lights, red, scarlet and orange all appear yellower than in day light. Yellow appears much lighter and indeed in light tints may easily be mistaken for white in gas light. Greens especially if bright and yellowish, appear intensified and yellower, while reddish blues and violets appear much redder. A deep violet looks like a black in gas light, owing to the want of sufficient violet rays in the gas light to show it up.

In studying the effect of artificial light on the aspect of dyed shades, many interesting facts come before our observation, phenomena that do not appear in painted or lithographed colors, or pigments under the same circumstances. It is possible for example, to have a piece of cloth dyed to match exactly a certain shade of olive or a grey painted upon paper. In daylight the dyed materials and the pigments may match each other closely; but examine them in gas or lamp light, and the chances are that they are no longer like each other. The painted colors will have changed little, while, very possibly, the dyed shades have completely altered in appearance.

In artificial light many greys dyed on wool become quite greenish in hue. Olives may become much redder, or much greener. Some dyed yellows change little, others, apparently matching them closely in daylight, may go reddish or even pinkish under the gas light. All this is very perplexing to the colorist, and gives the dyer no end of trouble. A harmonious balance of shades in a textile is often quite broken up when viewed in artificial light. It may be that one or two of the colors of the group, change in a different manner from the others, and the result is anything but satisfactory.

This subject is of great importance to those whose business it is to supply materials to be worn in artificial light, or to match accurately with another dress material. I have seen many instances where two colored materials are brought together, dyed by different dyes perhaps, but matching each other closely in colors in daylight. But in gas light they appear totally different, and if both were made into the one dress it would appear a two colored stuff in gas light. The reason for these perplexing differences in behavior is due to the different optical properties of the dyestuff used in the dyeing; and, before a perfect color match can be made, perfect in its gaslight, as well as daylight aspect, both dyestuffs must possess similar optical characteristics.

But this interesting subject carries us a little beyond the study of color harmony and contrast. We have covered practically the whole ground of our subject, and although the study of these articles may not make a great colorist, it will, nevertheless, help us to produce satisfactory and harmonious coloring; and what is more, help us to understand the laws underlying the various phenomena of the harmony and contrast of colors.

Consul-General G. Cornell Tarler writes from Bangkok that long stockings, coming up above the knee, are an important feature of dress for men and women and girls and boys in Siam. The national costume for both males and females is the panung, a waist cloth, usually of silk, the end of which is drawn in between the legs and fastened to the back, resembling knickerbockers. With this costume the high-class Siamese usually wear long stockings, lisle or silk, and Oxford ties. Distances are long in Bangkok, and walking is much resorted to. With the numerous factories springing up in all parts of the United States producing a "hole-proof" stocking with a guaranty, perhaps some attention will soon be paid to the city of Bangkok, the population of which is over 850,000.

TETRA CHLORIDE OF CARBON.

Its Uses in the Textile Industry.

Tetra Chloride of Carbon has the chemical formula (C Cl 4). It therefore represents marsh gas (C H4) in which all the hydrogen atoms have been replaced by chlorine. It is a clear, colorless, heavy, mobile liquid, boiling at 170 degrees F., with a specific gravity of 1.629. It is, therefore, nearly 63 per cent. heavier than water and weighs 13 pounds to the gallon. It is a perfect solvent for grease and oils of all kinds; rosins and many other gums; rubber, and when mixed with alcohol will dissolve shellac.

It may be mixed with alcohol, benzine, turpentine and similar bodies in all proportions, but not with water. It is absolutely unburnable, but it decomposes at a high temperature into chlorine and carbon. Although the boiling point is 170 degrees F. it vaporizes at all temperatures and its vapors have the property of extinguishing flame. For this reason when mixed with benzine and similar products they lose their inflammability, and the consequent danger of using them.

This product has long been known in laboratories, but was never of any practical use until electro-chemistry became a practical science, making it possible to produce it at a fairly low cost. Its manufacture on a small scale was begun about the year 1894, and the article was first put on the market at a cost of twenty-five cents per pound. It was first introduced into the United States in 1896, by which time the price had declined to eighteen cents per pound. Since then the consumption has been slowly increasing year by year and with the increased consumption, that is to say the increased production, the value of this article has declined 50 per cent., and it may now be bought in ordinary quantities at from nine to ten cents per pound, bringing it within the reach of many consumers who could not think of using it at twenty-five cents per pound.

It will be seen from the above that the principal characteristics of Carbon Tetra Chloride are:

First: Its low vaporizing point, which causes it to evaporate, when used on textile fabrics, very rapidly, without leaving any odor whatever.

Second: Its unburnable property which makes it of use under all conditions, even in the neighborhood of open flames.

Third: Its property of dissolving grease of all kinds.

In consequence of these properties it has come largely into use all over the world for cleaning fabrics. It is also used largely for extracting oils, such as cottonseed and linseed, from the cakes after all the oil has been extracted that is possible by pressure. This extraction not only saves four to five per cent. of the oil, but leaves the cake very much better adapted either for food or agricultural purposes.

One of the large applications of this product is in mills producing white fabrics, either of cotton, silk or wool. In the process of manufacture, all such fabrics are liable to come in contact with mineral oils which cannot be removed by soap or alkali and, even if they could be, in many cases the application of such injurious agents would ruin the finish of the goods and result in great loss. All mineral oil stains can be readily removed by Tetra Chloride of Carbon without the slightest injury to the finish of the goods, even should the goods be dyed with the most delicate colors, because Tetra Chloride of Carbon does not dissolve any of the modern colors, and consequently has no effect on the colors in the fabric. This is a very important point because a great many colors are injuriously affected by either the use of alkalies or alcohol.

ENGLISH DYERS' WAGE AGREEMENT.

The dyeing and finishing branch of the local wool manufacturing industry has, during recent months, been threatened with labor trouble owing to the dyers' demand for an advance of 73 cents per week over the present wages of $5.84.

The dispute has just been settled by a joint conference representing the organization of employers and workmen presided over by a member of the British Board of Trade. The agreement gives dyers 24 cents more per week at once, and 24 cents additional from July 1, 1911, making a standard wage of $6.33 per week of fifty-four hours, with additional pay for overtime. A conciliation committee is established, consisting of three representatives from each side, with their secretaries.

The importance of the dyeing and finishing industry in this district is shown by the fact that there are 157 separate establishments engaged in these processes. The finishing and dressing of cloth is a highly specialized business, and many of the finer grades of cloth in this and in adjoining districts receive their final processes at Huddersfield. As a rule spinners and manufacturers sent out their tops, yarns, or pieces to be dyed on commission, but some of the largest manufacturers of high-class men's wear have dyeing and finishing departments; and the worsted exports from this district to the United States are largely "home dyed and finished."

Even in the woolen trade, where the specialized mill is the exception, there is a great deal of commission dyeing and finishing, especially where fancy goods are made, requiring a large variety of yarns in different shades and colors. In no branch of wool manufacture are masters and men better organized than in the dyeing and finishing trades. The Huddersfield, Bradford and District Dyers and Finishers' Union was organized more than fifty years ago and has a membership of over 1,300. The success of labor organization in this trade is due in part to the fact that the trade is carried on almost wholly by men, very few women being employed.

The average earnings of dyers in this district for a full week's work were $4.25 in 1859, $4.86 in 1872, $5.35 from 1880 to 1901, and $5.64 in 1906. After July 1, 1911, the standard wage at Huddersfield will be $6.33.

Kabba, a native cloth, has a very extensive sale in most parts of northern and southern Nigeria, and also finds a market on the Gold Coast. The quantity of cotton used, in addition to the time required makes its manufacture not very remunerative. Because of the small price they command, the production of these cloths is on the decrease, as the prices realized for the cotton seed and raw cotton make it more to the advantage of the native to buy imported cloths. The market for cotton textiles is on the increase, and will probably continue so every year.

Practical Problems Discussed by Cotton's Readers.

We invite our readers to make use of this department for the discussion of any and all problems arising in the mill or the finishing plant. Questions, answers or letters need not conform to any particular style and will be properly edited before publishing. The editors do not hold themselves responsible for any statements of opinion or fact which may appear in this department unless so indorsed. This department is open to all.

DESIRES INFORMATION.

BY RICHMOND.

EDITOR OF COTTON:

A mill purchased from a broker one lot of cotton in bales. This was bought for good middling. Bales No. 1 and No. 2 were classed respectively good middling and strict middling, the classing being based on samples drawn from one side of the bale, irrespective of which side was up when the bale was placed on the scales.

When these bales were placed in the opening room and stripped of ties and sacking, it was discovered that one bale was about ⅞ badly stained and another about ½ badly stained. The broker agreed to settle on the bales at one-half cent per pound. The bales were billed at the original re-weight. Now the broker protests, saying the mill should charge only for the actual stained cotton, or in other words tear apart the stained from the good grade, weigh the stained and charge for that alone.

I will appreciate an expression of opinion from some of your readers as to their experience in similar cases, and what the ruling practice is in different parts of the country.

IN SUPPORT OF THE RAILWAY HEAD.

BY MANAGER.

In your issue of March, just at hand, I note an article by F. W. G. on the railway head. He says W. F. H. in his letter on the same subject, sounds like a machine shop man. If he thinks so, what must a good carder think of F. W. G.? Who ever knew, or even discovered, that in the working of the railway head, to even up the sliver, that the back roll speeded up, or slowed down? I wish to tell F. W. G. the effect this would have; it would, when speeded up, break down the sliver coming up to the back roll, or when slowed down, run slack at this point. Does he not mean that when a light place came to the railway head the *front roll* would slow down, and when heavy it would speed up?

In all my experience on the railway head, the back roll and two middle rolls run one speed all the time, but it was the front roll that does all the changing. I would suggest that he take a little more time and look this over and then write again, as evidently he is lost in the woods on this subject, and to us old heads it does not read right. Give me the railway head, on any cards built, and I can teach him or any one else no more familiar with them than he appears to be, to make more even work than can be had in any other way.

If I had the time at this writing I would enter into the subject more fully, and will do so later if F. W. G. would like to have me, after he has acknowledged the error made in this article of his.

SHEDDING AND PICKING IN POWER LOOM WEAVING.

BY A. A. D.

The shedding and picking of looms are some of the most important functions which the loom has to perform. Great importance is also attached to the correct setting and trimming of each so to obtain satisfaction all around, both to weavers, loom fixers and manufacturers. There are several methods of shedding in weaving. Closed shedding will be found to put great and unequal strain upon the warp and so cause breakages in the yarn, while more power is required in making this shed than in any other, as the principle of making a falling thread help to lift a rising one is absent, which function is found in many tappet, jacquard and single lifting dobby heads.

It will generally be found that open shedding is better than closed shedding, as the majority of the warp threads constantly form two lines and so it is only necessary in changes to take them from one another and as the rising and falling threads move at the same time, it performs its operation in a minimum of time and also greatly reduces all unnecessary strain upon the warp threads, thereby tending to increased production and a better quality of goods. However, there are many good shedding motions used which could not be classed as either open or closed, but which might be termed as semi-open shedding, which give first class results. Double lift jacquards and some dobbies perform sheds of the above description. For plain cloth weaving, tappets can be used with advantage to perform the shedding. They are simple and give the best results, in fact, no other shedding motion is so perfect. There is less strain put upon the warp threads; less power is required to work them; and they can also be worked at any reasonable speed, thereby tending to increase production with less faults in the fabrics. A few of the defects that are common and which are to be looked after carefully in shedding by tappets, are unequal shedding and also under and over shedding.

Dobbies and jacquards are necessary in shedding where the range of patterns is of a fancy line. The closed, open and semi-open shedding is employed in cases where single lift dobby and jacquards with double lifts are used, according to the variety of textures to be produced. Each of these shedding motions being suitable in certain varieties of woven fabrics. When shedding is mistimed, the warp is either open or closed without regard to the movement of the slay, which will produce bad selvages by the shuttle passing over instead of under the warp threads and will cause them to break out constantly. To give the most perfect results, the shed should be as small as the class of goods and the proper working of the shuttle will allow, thereby decreasing the stoppages of the loom on account of broken yarn and keeping up the production and output to their full working capacity.

The picking motion of a loom should be timed to follow the shedding at the right time, according to the class of goods woven, some requiring an early and some a late pick, but in both cases the shuttle should be picked across and through the shed, with as little power and obstruction as possible. Picking is accomplished by various methods, but in most cases it is done from the bottom or second motion shaft of the loom. Even in the best looms of today, the picking motion is in the nature of a jerk and in broad looms this can readily be seen. The picking motion is the most expensive part of a loom; it requires the most attention; the greatest amount of repairs; and it is necessary that the picking mechanism should be carefully set, as faulty setting will cause great trouble because of unnecessary breakages, with losses both to weaver and manufacturer. A good loom fixer is responsible in most cases for reducing the expenses in the picking motion of the loom, as so many breakages and annoyances are greatly relieved and remedied by careful and proper timing and setting. A few of the many things explained below which cause expenses to arise through this part of the loom being defective, will perhaps be of interest to some of the readers of this article.

If the pick is too strong, and the shuttle is not checked before it pushes the picker against the end of the box; if the spring of the shuttle peg is not strong enough; or if the shuttle peg is not thick enough; each and all of the defects will cause the cops to break, or the yarn to become loose and leave the bobbins. If one tried to alter the strength of the pick by moving the picking tappet or raising or depressing the picking bowl, it must be so arranged that the full width of the picking point is acting on the bowl, otherwise a very faulty pick will be the result and will require the loom fixers attention from time to time. Great care should also be taken by the weaver to keep the spindle and picking bowls well oiled, as this will also save lots of time and expense.

In most looms the swells are made of iron and in some cases are too heavy and tend to cause the breakages of cop which they should prevent. The swells, whether of iron or wood, should be shaped so that it will check the shuttle gradually, too much spring on the swells may knock cops off, wear out the shuttles, or cause the loom to bang off, while too weak a spring will also knock off the cops, cause the shuttle to rebound, or make a smash. The speed of the loom, if variable, also causes defective picking. Smashes are of frequent occurrences in weaving, through the shedding and picking working independently of each other, which could only be obviated by positive connections, as also is the case with the present system of negative picking, which is the cause of so many accidents through flying shuttles. The application of a positive driven shuttle would ensure the safety of the operative. All these various details in the shedding and picking of a loom can only be attended to and remedied with success by careful attention and practical experience.

As a result of recent trade opportunity reports from Consul Robert J. Thompson, at Hanover, Germany, business men there have ordered American shop tools and woodworking machinery and office furniture, while a line of American corsets has been added to a Hanover store, attention to the origin of the goods being directed by United States flags.

CARD ROOM POINTERS.

BY A. M. MACADAM.

Carding is one of the most important processes through which cotton passes. If the stock is well carded and drawn, good yarns can be spun and a high percentage of good cloth produced from the looms. With stock poorly carded, the best of skilled weavers cannot make good cloth. Trouble in a card room can sometimes be traced to the picker room. The unevenness of the lap will be reproduced in the card sliver and if the picker does not properly remove its share of heavy dirt and matted fibers, the cleaning properties of the card are taxed beyond their limit and the sliver is bound to be specky and full of reps. Care should be taken in the mixing of the cotton to get as even a mix as possible in regard to dirt, color, moisture and density. The character of the waste from the beaters should be examined frequently. The grids should be so set and the fan draft so regulated as to allow all dirt and other foreign matter to drop down. The fan draft should not be weak enough however to allow good fibers to be beaten through the grids.

Enough pressure should be applied to the top feed roll to insure the beater striking the cotton from the feed rolls evenly all the way across and not in large tufts or bunches. Screens should be kept clean and perfectly round. The gears driving them should be well tightened to the screen shafts. If loose, the screens will hesitate and make a thick place in the lap. The evener should work freely and the belt be kept well up toward the large end of the driving cone when running the normal weight. The finisher laps should be weighed as often as possible and all which vary one-half a pound from the standard should be turned back.

The cards should be ground lightly once every two weeks. Grind lightly and often, should be a byword. Care should be taken not to hook the wire with heavy grinding. Especially be careful to grind lightly if using fine pitch emery fillet, as the wire is sure to be hooked with heavy grinding. Pick up all jammed and bent wires before grinding. The leader should be kept in good repair. Keep the flats sharp and the grinding shoes set so they present the flats to the grinding roll in such a way as to grind evenly across the face of the wire. The settings should be suitable for the stock being run and the amount of waste desired.

Cards should be stripped carefully at least twice a day and the grinder should be held responsible for their condition. Strippings and fly should be examined and weighed from different cards and any difference between them rectified. Differences in weights of card slivers are often due to the different amounts of waste removed by the cards, rather than an uneven lap.

Drawing frames should be scoured once every two weeks. Examine all leather top rolls once a week, oil the shell rolls and replace with new ones those which are uneven, soft, or have the varnish worn off. See that all bottom steel drawing rolls bear evenly in the bearings of the roll stands. Set the rolls for the length of the staple. The gearing should be examined each time the rolls are scoured and all broken or worn gears replaced with new ones. Remember an ounce of prevention is worth a pound of cure. The tension between the calender rolls and front drawing roll

should be only enough to keep the stock from sagging and not enough to unduly stretch the sliver. The web, as delivered from the front drawing roll should be even and each strand continuous. The end strands, composing the web, will sometimes cut and form bunches in the drawing sliver. This may be caused by too much calender tension, bad top rolls, or wrong hanging of the top roll weights.

The fly frame rolls should be adjusted to the length of the staple and the solid rolls kept well oiled but not enough to stain or injure the leather top rolls. It is a good plan to oil the top shell rolls once every three or four weeks and to replace those badly worn or with loose coverings. It is well to replace the back roll with the middle roll and to put in a new middle roll at least once every six months. The tension between the bobbin and front roll of a fly frame should receive careful attention. If it is too much the roving will be unduly strained and a weak, uneven yarn will surely be the result. Normal drafts should always be used. "Singles" or "doubles" should not be tolerated and fly frame tenders should be held responsible for all bad roving made by them. Any excess over a low normal rate should be followed by dismissal. Soft bobbins which are up to size, or bobbins with run overs on the tapers should be removed from the spindles as soon as detected and placed in separate boxes and taken to the spinning room as a separate lot to insure an easy handling.

Sizings should be made four times a day from the drawings and slubbers and any differences from the standard rectified at once. Sizings from the cards should be made twice a week or at any time when the drawing size varies greatly from the standard. Sizings on fly frames should be made once a day at least and thus keep a check on the other sizings. It is a good idea to size any frame, which has broken down, directly after starting. Any error in replacing gears can at once be found in this way.

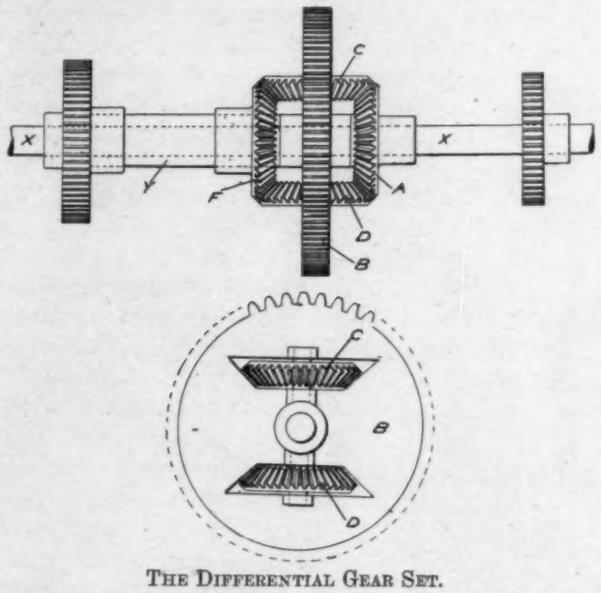
Any reasonable objection of the spinner or weaver should be considered, in so far as it does not affect the production with the same good quality of work.

DIFFERENTIAL GEARING OF FLY FRAMES.

BY W. T. W.

As a uniform amount of roving is constantly being delivered by the front rolls of a fly frame, it is obvious that there must be some change in the speed of either the bobbins or the flyers owing to the fact that as the roving is wound upon the bobbins they increase in diameter and take up more during the same period of time than they did when first started. It can readily be seen that it is impracticable to have the speed of the flyers vary, as such would produce a variation in the twist of the roving. It is, therefore, necessary to alter the speed of the bobbins.

In the case of bobbin-lead frames, which we will deal with, the speed of the bobbin must be reduced as it grows larger in order that the excess circumferential speed of the bobbin over the flyer shall at all times be equal to the circumferential speed of the front rolls. The differential used in connection with speed cones accomplishes this object. The bevel gear A is keyed to the shaft X. The sun-gear B which carries studs on which the bevel gears C and D revolve, is loose on the shaft X. The gear F is keyed to the sleeve Y loose on the shaft X. The shaft X is driven by gearing from the front drawing roll, therefore its speed and also the speed of the bevel A is constant. It can be readily seen and is a known mechanical fact that each revolution of the sun-gear B will cause the gear F to be accelerated two revolutions. For example: If the gear A has a constant speed of 300 R. P. M., and the gear B remains motionless, the gear F will make 300 R. P. M. but in opposite direction to the gear A. Now, should the gear B be given 30 R. P. M. in the same direction as the gear F, the latter will make 300+(30x2)=360 R. P. M. If the speed of A remains unchanged and the speed of B is reduced to 20 R. P. M., the speed of F will be 300+(20x2)=340 R. P. M. The sleeve Y which receives motion through the gear F is, by means of suitable gearing, made to drive the bobbins, therefore, any change in the speed of the sun-gear B will affect the speed of the bobbins, as outlined above.



THE DIFFERENTIAL GEAR SET.

It is now necessary to secure a method for suitably reducing the speed of the sun-gear in order that the speed of the bobbins may be gradually diminished as they increase in size with each layer of roving wound. This is effected by the intervention of a pair of cones between the source of power and the differential gear; the belt which connects these cones being moved slightly from the larger to the smaller end of the driving cone each time the traverse of the frame is changed, which is readily done by means of a rack and pinion. The above describes the simplest differential, but they are all based upon the same principle.

Consul J. E. Rowen, of Punta Arenas, suggests that wool buyers of the United States should send agents there to purchase wool direct instead of through the auction markets in London, as it would save various expenses. The yield of the Chilean territory of Magallanes was approximately 16,000,000 pounds in 1906, and is increasing in quantity every year. Such direct purchases would stimulate direct trade between southern Chile and the United States. The same thing would be true, fundamentally, for all South America.

The most noticeable expansion in the exports of cotton manufacturers for the past year was in the goods sent to the Philippines, the value of which amounted to $2,936,398, as compared with $1,059,042 for 1909.

NEW MACHINERY AND TRADE NOTES.

NORTHROP LOOM WEAVERS EXEMPT.

The following extract from *Cotton Chats,* the interesting little magazine issued monthly by the Draper Co., Hopedale, Mass., is attracting a great deal of attention among cotton mill operatives:

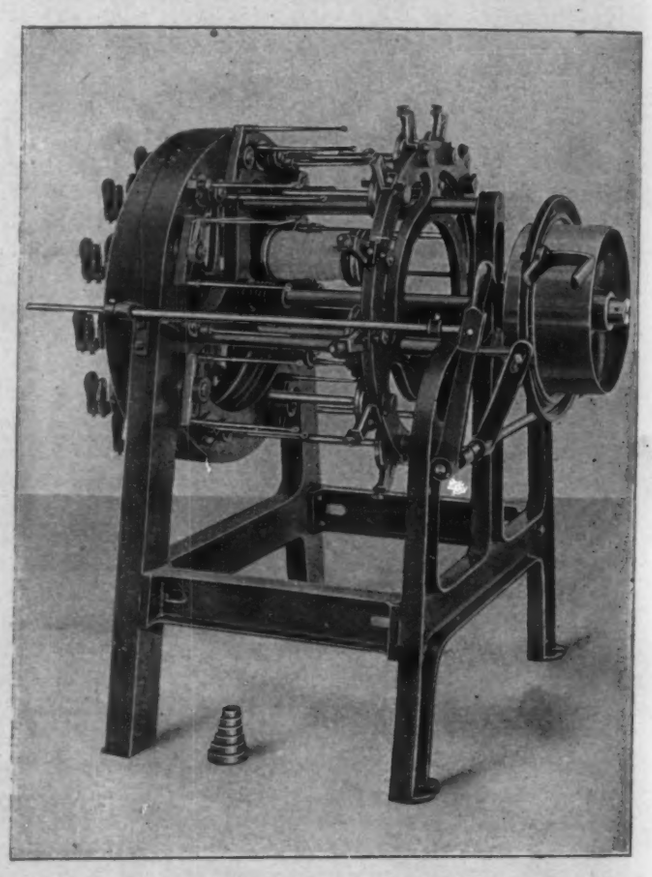
Certain trades or vocations have always been specially unfortunate in providing victims of consumption. Among such vocations, that of the weaver carries unusual risk in the process of threading the shuttles. In this process the mouth is applied to the eye of the shuttle and the filling is sucked through; generally it stops in the mouth but it sometimes goes farther. The same shuttle is frequently threaded by different persons, affording ample opportunity to transfer germs of all kinds from one mouth to another. In a cotton mill on plain goods and medium numbers, a weaver threads the shuttle of one loom about 100 times per day. An eight-loom weaver would therefore perform the operation 800 times per day; in a year of 300 days this would be 240,000 times; or in round numbers over two hundred thousand chances per annum of inhaling germs of consumption.

It is a well known fact that the Northrop loom provided with self-threading shuttles absolutely removes the "shuttle-kissing" danger from the weaver's vocation. This means that thousands of weavers are enjoying better health and that a very considerable number have had their lives prolonged by our improvements.

A NEW 12-SPINDLE TUBING TWISTER.

To meet the demand for a perfectly formed and twisted strand for woven hose, auto tires, duck, shoe threads, sail twines, etc., whether from cotton, flax or jute, the Haskell-Dawes Machine Co., of 176 Federal Street, Boston, Mass., have recently invented and are now placing on the market a twelve-spindle, single capstan, geared, tubing twister, with 5x7 bobbins, and of superior merit. This machine will at once commend itself to all manufacturers because the best twisters now being offered for the above purposes are necessarily geared in order that positive results may be secured. These are usually constructed, however, with ten to twelve gears for each spindle, while the improved twister illustrated herewith uses only two and one-sixth gears for each spindle. Another important feature about this twister is that it has but one capstan, centrally located on the socket. This is easily oiled and therefore does away with all the oiling troubles and works just like an ordinary journal.

The capstan itself is changed to vary the twist thus avoiding any risk of not having the gears meshed properly, as the gears all run from fixed centers. This method also provides a means for making any slight changes in the twist which is often impossible with ordinary gears where one tooth makes too great a difference. The large 5x7 bobbin gives great length of strand without a knot, which is always a desirable feature, as well as making a great saving in the doffing. As this is the size used on beaming creels for duck, these bobbins will fit the creels now in general use. The makers assure us that they can guarantee this twister to cost less per spindle, to produce more perfect strands at a less cost per spindle in repairs, and to require less power than any other twister on the market producing strands of equal quality. They will be glad to furnish other information and catalogue upon inquiry.



Haskell-Dawes 12-Spindle Tubing Twister.

The E. Howard Clock Co., Boston, Mass., have recently made quite an extensive contract with the Pacific Mills for their new worsted mill in Lawrence, Mass. The equipment consists of one of the largest style regulator type watchman clock, which is fitted with a contact to electrically operate 20 secondary clocks throughout the different rooms. The station boxes, which are connected with this same clock, produce an indisputable record of the rounds of the watchman all over the mill in the most remote portions. The record itself being produced on a record dial located in the large clock which is so placed that the watchman has no access to it. Similar outfits have quite recently been supplied to the Ayer Mills and Wood Worsted Mills, also the Everett Mills, all in Lawrence; to the American Warp Drawing Machine Co., Boston; Lorraine Mfg. Co., Pawtucket, R. I.; Annawan Mills, Fall River; Bigelow Carpet Co., Lowell, and the Gorham Mfg. Co., Providence, R. I. They are at present working on a contract for the Lancaster Mills, Clinton, Mass.

HEAD GATE HOISTING MECHANISM.

One of the most important and interesting features of a hydro-electric plant is the proper construction and installation of the head gate hoisting mechanism. The illustration shows the head gates and hoisting mechanism at the 99-Island Station of the Southern Power Co.

This equipment was furnished by the DAYTON GLOBE IRON WORKS CO., Dayton, Ohio, and consisted of the head gate hoisting mechanism for six main gates, and one exciter gate; the main unit gates were 16 feet wide by 10 feet 6 inches high, and were placed with the center of the gate 27 feet 6 inches below the head water level, and 36 feet below the top of the bulk head wall on which the hoisting mechanisms were placed. The exciter gate was 10 feet square, and was placed 32 feet below the head water level and 40 feet 6 inches below the top of the bulk head wall. These gates were constructed of timber and had steel stems constructed of 9-inch channels and 8-inch I-beams on the main gates, and 9-inch channels and 6-inch I-beams on the exciter gate. All gates were of the double stem type and the main gate stems were fitted with spur racks 9-inch face and 3-inch pitch, while the exciter gate stems were provided with 5-inch face and 2-inch pitch spur racks. The

HEAD GATES AT THE 99-ISLAND STATION OF THE SOUTHERN POWER COMPANY.

hoisting mechanism for the main gates was of a special design, and consisted of five very heavy bearing stands overhanging the edge of the bulk head wall. These five stands supported the main pinion shaft and back roll shaft, and the power was applied to the pinion shaft through worm gears and bevel gears; the entire system of the six hoists was arranged for either motor or hand operation and a series of pin clutches was provided to release the motor drive, or to throw in the hand wheel for hand operation. The total length of the equipment was approximately 150 feet, and the motor was connected at one end of this line shaft with power transmitted from the motor to the shaft by means of a chain drive. Each of the hoisting mechanisms are provided with a ball bearing to take care of the upward or downward thrust of the worm wheel. The hoists are very substantially built throughout and are intended to operate under extremely severe conditions.

SPECIAL RAMBLER MAGAZINE.

The experience of four hundred motor car owners, with cars of many different makes and extending over a period of ten years, has been drawn upon by the Thos. B. Jeffery Co. in the publication of an unusual number of the *Rambler Magazine*, the most widely known house organ in the automobile industry.

The Rambler people have combined in a series of articles the best ideas of those four hundred owners as to what constitutes the principal points to be decided by the purchaser in choosing his car. Choosing the maker is the first consideration. The owner's comfort and the advantages that make it possible is the subject of the next article, while a third tells of the ideal relation that should exist between the factory and the owner, insuring to the owner the service and satisfaction that he expects. The *Rambler Magazine* is of standard magazine size, printed in three colors, and is sent free to any one who makes request of THE THOMAS B. JEFFERY CO., Kenosha, Wis.

Business isn't bad with THE STANDARD PAINT COMPANY. This is evidenced by the fact that the increased demand for Rubberoid roofing and flooring, giant and P. and B. papers and the P. and B. products has necessitated the removal of the Chicago office to larger and more commodious quarters in the Peoples Gas Bldg., at 150 Michigan Ave. The recent court decision in favor of Rubberoid colored roofing—red, brown, green—the only prepared roofing with permanent colors that can be manufactured—has served to popularize this particular class of roofing very extensively. The colors are built into the fabric during the actual process of manufacture and are an integral part of the material. It is the ideal roofing for residences, bungalows or wherever an absolutely waterproof, weatherproof and durable roofing with artistic effect is desired.

WILLIAM WHITMAN & CO. issue an attractive folder bearing the trade-mark of the Arlington Mills and containing samples of many of the well known dress fabrics for American women with standard color card. A distinctive feature of the samples is the plain statement that they are all wool or wool and cotton as the case may be, with particular attention called to the necessary standard construction of the brilliantines and mohairs which are the equal of any goods of this character made in any part of the world. This folder with samples as described will be sent to anyone making request to William Whitman & Co., 350 Broadway, New York.

Soluble softening oil, manufactured by the ARABOL MFG. CO., 100 William St., New York City, is one of the most effective softening and sizing oils in the market. As a softener it surpasses tallow. Manufacturers like it because it is easy to handle, is always reliable and is not influenced by temperature. It gives a smooth finish to the warps, the threads divide well in the lease rods, and the cylinders of the slasher remain perfectly clean. It is neutral and most suitable for strong and close woven goods, such as corduroys, velveteens, sateens, twills, umbrella cloth, cambric warps, etc.

MOTOR TRUCKS FOR TEXTILE PLANTS.

The Gramm Motor Car Co. is now occupying its new plant at Lima, Ohio. This plant is probably the largest exclusive truck factory in the country and is beyond a doubt one of the best equipped automobile factories that may be found anywhere. The buildings are constructed of reinforced concrete, the side walls being almost entirely prism glass, insuring a very uniform and sufficient light. The present factory consists of the main building, the forge building and power station.

The main building is a two-story structure, having two wings. It is 450 feet in length, the wings each being 200 feet long. The first floor of the plant is devoted almost entirely to the assembly departments, such as wheel, motor and chassis assembly. Adjacent to the motor assembly is the motor test block, where all motors are very carefully tested under their own power, and inspected before they are installed in the trucks. In the No. 1 wing on this floor is the rough stock and receiving room. Side tracks from all roads reaching Lima come direct to the doors of this room, making it one of the most accessible plants to be found anywhere. No. 2 wing is devoted to the body department, which is very complete in every detail. This department has built some of the finest bodies now in operation upon trucks, and is in a position to turn out the highest class of work in any quantity and of any description desired.

The main machine shop is situated on the second floor. In the machine shop, electric drive is used throughout, the larger machines being equipped with individual motors and the smaller machines, such as the Brown & Sharp gear cutters, drill presses and other machines of this character, being placed in groups and driven from single line shafts. Adjacent to the machine shop is the tool room, where a large force of expert tool makers are employed, making the very finest grade of jigs, in order to enable the machine shop to quickly and accurately produce the standard of work required in all Gramm trucks. On this floor is also the grinding room, equipped with modern grinding machines for the finishing of shafts, cylinders, pistons, piston rings, etc. The transmission parts and front axle assemblies are also on this floor. The finished stock room is in the No. 1 wing, directly over the rough stock room, while the body painting department is in the other wing, directly over the body department.

It is interesting to note the continuous passage of the work through the factory. The rough stock is received on the first floor in the receiving room, passing from there directly into the rough stock room. From here the stock passes directly upstairs to the machine shop, then through the inspector's room to the finished stock room. In all its travels through the factory, it is not necessary at any time that any of the stock shall be taken back and forth over the same path, as it passes along from one department to the next.

In the forge building in addition to the hand forges and a large amount of forge machinery, is the heat treating department, in which gears and other parts are subjected to a very careful heat treatment; and also the frame department.

The power station is a model of its class. The latest type of Wicks vertical water tube boilers are used, together with the highest grade of auxiliary apparatus. A cross compound engine provides power for the entire plant. The engine room is also equipped with an air compressor with an automatic governor, producing a constant pressure of 120 pounds in the air tank placed in the basement under the machine. This room is finished with white tile walls to a height of ten feet, above which yellow glazed brick is used. The floor is of tile finish and altogether presents a most attractive appearance. In another part of the same building is a large dining room where, at a very low cost, noon lunches are served to the employes of the company.

All the buildings are of the most modern construction throughout. They are equipped with Cooper-Hewitt mercury lamps, giving an unusually uniform and soft light. Automatic sprinkler systems are installed in every department, despite the construction of the factory, which appears to be almost fireproof.

The Gramm Motor Truck.

The cars produced in this plant are of an equally high grade of construction as the buildings. Every care is taken that they shall be first-class and absolutely no defective parts, of any character, are allowed to enter. The highest grade of engineering skill is employed in their design and the best materials which can be purchased are used in their construction. Four sizes are built, of one, two, three and five-ton capacity. The three and five-ton trucks are of particular pride to the company, and are well adapted to the hauling of freight where large quantities must be handled. This is particularly the case with many large textile factories situated some distance from a railroad, who are thus forced to haul their raw and finished material a considerable distance to the mills. The unusually fine equipment of the company allows it to produce bodies of cars which are adapted to this class of service, to a larger degree than would be possible in case of a smaller concern backing the truck. Gramm trucks are based upon an experience extending over a period of more than ten years. The men at the head of this company are practically the pioneers in the motor truck business of America.

We are in receipt of Vol. 7, No. 2 of *The Cortright Metal Shingle Advocate*, which contains its usual list of useful and interesting matter. We are informed by the publishers that any of our readers that desire to have their names added to the list for a one year's subscription to this little magazine, may receive that subscription free by writing to the Cortright Metal Roofing Co., 50 North 23rd St., Philadelphia, Pa.

THE BLEACHERY MANAGER.

The word "manager" signifies one who controls and directs, but when used to designate the man at the head of the business who is so dependent upon his foremen that he finds it impossible to do otherwise than as they wish, such a man is not a real manager. A properly managed plant is one in which all the operations are performed in accordance with well developed plans, and where nothing is left to hasty judgment. As frequently conducted, nearly all the operations in a bleachery and many other plants, are liable to be modified by the foremen to suit what seems to them to be the necessities of the case, and the finisher of cotton goods is often put to his wits end to get a uniform finish on goods bleached in an irregular manner. Moreover, the ordinary method of piling goods after souring, or chemicing, and drawing from the top of the pile is a most successful method of dividing a lot into several parts which worries the finisher and makes short lots in the shipping room.

Proper management requires that these irregularities be eliminated, and that each lot of goods goes from the gray room to the shipping department intact, and by a prescribed route. The operation of a bleachery in such a manner is considered by many to be impossible of accomplishment, but the fact that it is being done would seem to dispose of this argument. As a matter of fact, the only reason that the art of bleaching and finishing has not been put on the same basis as steel rail making, for instance, is because it has not been given the same study by educated men, that has been accorded many other industrial processes.

The first step towards putting the bleaching process on such a basis has been successfully taken, for continuous piling machines, which have been in use five years, make it possible to give all goods of a lot, or any number of lots, identically the same treatment in a continuous passage from the kier to the white bin. Goods thus come to the finisher uniformly bleached and in complete lots, and the shade of the finished goods is uniform from one end of the lot to the other, whether the finish is white or dyed. Moreover, if the goods progress through the various processes of bleaching and finishing according to a regular schedule, the manager can know at any time where any lot is, and make his promises of delivery without sending all over the works. In the manufacture of locomotives promises of shipment are made and kept, because each piece proceeds through the works to the assembling floor by a pre-determined route, and at a known speed.

By means of continuous piling machines a pre-determined route and speed of goods through a bleachery can be established and accomplished, and the art of bleaching and finishing cotton goods can be made more nearly an exact one, rather than one where the skill of the finisher is often largely employed in getting uniform results on goods which have been irregularly bleached. Besides the improvement in quality thus obtained, there is the direct saving in the wages of piling boys, and the damage they do to the cloth. The best known machine for this work, the GANTT PILING MACHINE, has attracted much attention in England, especially among the dyers, who realize in it a means of getting uniformity. Over 60 of these machines are now in use in the United States, distributed in ten bleacheries. They simplify the work of the bleacher, finisher, and shipper, and make the customer satisfied because they help to get him prompt and complete shipments.

This machine is manufactured and sold by the Gantt Piling Machine Co., 60 State Street, Boston, Mass.

PERSONAL.

Joseph L. Ivers, formerly overseer of ring spinning for the I. E. Palmer Co., has accepted a position as overseer of ring spinning, spooling, warping, etc., at the Greylock Mills, North Adams, Mass. Mr. Ivers was one of the prize winners in COTTON'S prize letter contest a short time ago.

Prof. W. F. Schaphorst, of the mechanical engineering department of the New Mexico College of Mechanic Arts, has resigned his position there to become a technical writer on the staff of A. Eugene Michel, Advertising Engineer, New York City.

H. S. Gibbs, 617 Pacific Electric Building, Los Angeles, California, will accept a position as Southern representative for a reliable Eastern or Western house. Has wide acquaintance among manufacturing industries, architects and engineers of the South.

Nelson G. Stark, who represents the KEYSTONE PULLEY Co., of Oneida, N. Y., is making a trip through the South and was a very welcome visitor to the offices of COTTON recently.

The officers of the newly formed Evening Alumni of the New Bedford Textile School are president, James Griffin; vice-president, Louis R. Kerr; secretary, Benjamin Woodsome; treasurer, Walter H. Underdown; executive committee, Leonard Mellor, Frederick W. Holt and Frank Buckley. The president would be pleased to have evening graduates living away from New Bedford drop him a postal, giving their present address and business, to 178 Crapo Street, New Bedford, Mass.

The H. B. SMITH MACHINE Co., Smithville, N. J., announce that they have made a change in their representation in the Middle Southwest in the sales department of wood working machines, and hereafter will be represented in Western Tennessee, Mississippi, Louisiana, Eastern Texas, Oklahoma and Arkansas, by L. D. Jones, who will establish headquarters at Shreveport, La., and call upon the trade from that central point.

The FARBENFABRIKEN OF ELBERFELD Co., 117 Hudson St., New York, are sending out two volumes of color cards; one volume devoted to cotton colors and the other volume to colors for wool. They have thought it advisable to issue these supplements in the form of a compact volume instead of publishing them singly as before, thus making a very practical and valuable book for reference, that will have a permanent value to every dyer and other user of colors. Another special feature which they have adapted to these volumes is a list of combination shades with samples, representing the latest fashions, which they have incorporated near the end of each volume.

PAPER TUBES FOR TEXTILE USES.

Some six years ago, there was organized in Lowell, Mass., a corporation for the manufacture of paper tubes for the use of the cotton mills in that locality. This company, the Lowell Paper Tube Corporation, was composed of four expert tube makers and how well they have succeeded in their enterprise, is shown by the fact that today they have a complete, up-to-date plant with modern paper tube machinery equipment, suitable for the manufacture of any kind of a paper tube, cone or shell construction, up to a diameter of six inches. They have recently acquired the plant and business of the Corperdix Paper Tube Co., which gives them added facilities in the spiral wound tube department. They make a specialty of cones and tubes for cotton

yarns, and spiral wound cores for winding rope, cloth, etc., in any length from one foot to 40 feet. They also make all kinds of cop tubes both straight and tapering, and are prepared to quote independent prices, being in no way connected or associated with any other concern. Concerns needing paper tubes may advantageously be referred to the Lowell Paper Tube Corporation, of Lowell, Mass.

J. E. Conant & Co., auctioneers, Lowell, Mass., say that the sale of the plants of the Knoxville Woolen Mills, at Knoxville, Tenn., on the 1st and 2d day of March, established a precedent in the South, in so far as the several properties were pledged without limit or reserve of any kind whatsoever, to the highest bona fide bidders at absolute auction sale. The usual custom of the South has been, to offer manufacturing properties subject to an up-set price below which no offers will receive consideration; to offer and sell them, the sale being subject later or afterwards to the confirmation of a court; or to offer properties first in parts and then as a whole, adopting the way that brings the greatest total.

The real estate was assessed for $100,000. It was divided into seven parcels and realized $80,250, or more than 80 per cent. of its assessed valuation, a large percentage at any kind of sale and particularly in manufacturing realty. The machinery, mechanical equipment and other personal property was assessed for $107,000, and brought a total of almost $69,000, or more than 64 per cent. of its assessed value. More remarkable in the size of its percentage than the real estate because it included everything—good, bad and indifferent. Another most exceptional fact is that the larger portion of the machinery, etc., went to purchasers at a greater distance than 500 miles from Knoxville. All this happened in our judgment because the public were thoroughly advised before the sale that the highest bona fide bidders should be the absolute purchasers and get immediate deliveries. The attendance for the two days comprised some 200 strangers to Knoxville and its environment. There was hardly a textile district of consequence in the United States that had not a representative there as a bidder. We are convinced that the most interested stockholders were happily disappointed because of the unexpected amount realized from the sale.

POLYPHASE INDUCTION MOTORS.

Improved operating conditions and increased efficiency have been brought about in widely different industries through the introduction of the polyphase induction motor. Its extreme simplicity of construction makes it practically "fool proof" and the possibility of using it in connection with a high tension transmission system has contributed materially in reducing the cost of delivered power.

In textile mills, woodworking plants and other places when a small spark may easily cause an explosion or dangerous conflagration, squirrel cage induction motors may be used with perfect safety, as their construction involves no sliding contacts.

There are, however, many characteristics inherent in induction motors that are not found in any other machine in the market and that must be taken into account in applying the motors to industrial apparatus. On the proper consideration of these features depends the success of the application. The discussion of induction motor design presented in a pamphlet (Bulletin 126) recently issued by the Crocker-Wheeler Company, of Ampere, N. J., is therefore of vital interest to every person in any way interested in the application of motor drive to industrial machinery. It is handsomely illustrated throughout with half-tone engravings which show many interesting applications as well as presenting the details of construction of the machines themselves.

The Crocker-Wheeler Co. announce the appointment of Clarence E. Delafield as district manager for their company with headquarters at the Crocker-Wheeler offices in the Boston Safe Deposit and Trust Bldg., 201 Devonshire Street, Boston, Mass. Mr. Delafield succeeds R. N. C. Barnes, who recently resigned.

The Engineering Magazine has just added another interesting volume to its "Works Management Library," entitled "Industrial Plants; Their Arrangement and Construction," by Charles Day, who has been engaged as consulting engineer, in the construction and reconstruction of a number of successful shops and factories.

We have read much of scientific shop management and other work in the daily life of the industrial engineer, but in this new work, Mr. Day begins at the beginning and tells how the shop or plant should be constructed in the first place, so that good management can afterwards get the largest possible production from any certain stated equipment. He deals consecutively with the following general subjects: General classification of the work nature of industrial plants; determination of specific requirements; selection of the site and definition of building and equipment features; detailed plans and specifications; construction work and installation of equipment; period of occupation and commencement of operation; routing; metal working plants; machine shops and their specific requirements; modern industrial plants; value of an engineering organiza-

C. E. RILEY, Treas.
Boston Office
65 Franklin St.

HOWARD & BULLOUGH,
American Machine Company, Ltd.
PAWTUCKET, R. I.

Southern Offices
814-816 Empire Bldg
Atlanta, Ga.

COTTON MACHINERY

Are You Interested to know what is the best?

Send for our Descriptive Circulars with lists of users

Hopper Bale Openers
Feeders
Self Feeding Openers
Breaker Intermediate and Finisher Lappers

Revolving Flat Cards
Drawing Frames
Slubbing Frames
Intermediate and Roving Frames

Improved Spinning Frames
Twisters
Cone Winders
Warpers and Slashers

WE INVITE YOUR INVESTIGATION AND COMPARISON

tion to the project; and compensation for engineering and construction service.

This is a book which will be rated very highly by all persons interested in industrial plants and their success.

The New Bedford Textile Co. are making a specialty of English Hook Twister Bands and they are being used by practically all the New Bedford Mills, and in many mills throughout New England both in the cotton and worsted line. They manufacture nothing but the highest grade banding and are finding business very satisfactory. M. T. Glennon, president, formerly of the Wilkesbarre Lace Mfg. Co., Wilkesbarre, Pa., and C. R. Gridley, treasurer, are the active officers of the company.

The Cassella Color Co., 182-184 Front St., New York, are sending out their Supplements Nos. 65 and 66 to their regular book on cotton dyeing. Supplement 65 illustrates Diamine Nitrazol Green S. This is a new member of their widely employed group of diamine nitrazol greens, and like the older brands, is used as a coupling dyestuff. While possessing very good fastness to washing like the other brands it surpasses these in brightness of shades, possessing also the advantage of yielding green shades not only by coupling, but also in its direct dyeings. This dye is well adapted for the production of coupled dyeings on loose cotton yarn and piece goods, dyed in open vessels and in mechanical apparatus, and is valuable for printing on account of its good dischargeability.

Supplement No. 66 describes Diaminogene Blue 2 R N, which in its properties resembles their well known diaminogene blue brands, and developed with Beta Naphthol gives bright navy blue shades of very good fastness to washing and light, which are very easily dischargeable. This new dyestuff is suitable for the dyeing of loose cotton, yarns and piece goods and is very well adapted also for machine dyeing. On account of its easy dischargeability it is particularly valuable for printing.

The Lestershire Spool & Mfg. Co., makers of high grade spools and bobbins, Lestershire, N. Y., have recently installed a complete new equipment for manufacturing metal head spools. Some of this machinery was imported from England, but most of it was built especially to order, as in its manufacture this spool requires special machinery. This new installation became necessary, owing to the increased demand for the spools. They have been manufacturing this spool for over three years, although they advertised it but little, desiring to thoroughly try it out before pushing the sales end of the business. The makers claim that this spool is proving a great economy in several hundred mills throughout the country. With this new machine equipment the capacity for making these metal spools is 5,000 finished spools in a day of 10 hours.

The Allis-Chalmers Co. are distributing Bulletin No. 1042 entitled "Allis-Chalmers Generators and A B C Engines." This bulletin covers small direct connected units suitable for exciters for large plants and for furnishing light and power in office buildings, etc. A copy will be mailed on application to their general offices at Milwaukee, Wis.

INDUCTION MOTOR DRIVE IN AN ELASTIC WEB MILL.

A recent installation of induction motor drives in an elastic web mill is of interest for two reasons. In the first place, the motor drive was installed instead of enlarging the present steam plant which uses natural gas at only 10 cents per 1,000 cu. ft., and in the second place, the style of looms and method of weaving are out of the ordinary.

The installation was made in the plant of the Mansfield Elastic Web Co., who manufacture elastic webbing such as is used in surgical bandages, suspenders, etc. In the web looms the warp consists of threads and rubber bands under tension. While weaving, the rubber is under tension, but when released the rubber strands pull back, giving the material a solid appearance such as any woven textile. These looms contain from 20 to 40 shuttles sliding in slots somewhat similar to ribbon machines.

For a number of years the original mill of the company has used gas-fired boilers and steam engines, with the usual belt and shafting transmission, and when, about a year ago, it was decided to enlarge the plant, making it more than double its former capacity, it had fully been decided upon to enlarge the steam plant and to extend the shaft and belt drive to the new factory. However, the Ideal Electric & Manufacturing Co., who have a line of induction motors especially suitable for this line of work, finally convinced the mill owners to allow them to install motor drives and the results in economy have far exceeded guarantees.

In the new building there are about 35 looms averaging 40 shuttles each, and in the old plant, which is still being run by steam, there are 24 looms averaging 29 shuttles each. Thus in the new plant there are practically twice as many shuttles as in the old. However, the cost of running the new plant is less than half of the present cost of running the old plant. For instance, the average bill for power current in the new building for the past three months has been about $46.00 per month; while the bill for gas in the old plant was $43.00 per month, and to this must be added the engineer's salary of $60.00 per month.. In addition to this, there are further charges against the old plant as follows: $5.00 per month for water and $3.50 per month for oil over what it costs to lubricate the machinery in the new plant. Thus, the cost of power in the old plant is $65.50 more per month than in the new plant, and at the same time, twice as many shuttles are being run in the new plant.

The output of the two halves of this plant is also greater than two to one in favor of the electric drive, inasmuch as the motor-driven looms are run at least ten per cent. faster than those in the old mill. This higher speed is possible because the motors run at a uniform angular velocity, practically eliminating breakage of the warp. It is also, further, due to the fact that the motors are at all times directly under the control of the operator inasmuch as one operator, who tends two looms, can instantly stop or start either loom from either end. This control is accomplished by having a long rod extending across the entire width of the looms. The operator is further assisted by the fact that in case one of the rubber strands breaks, an electric contact is made which sounds a bell.

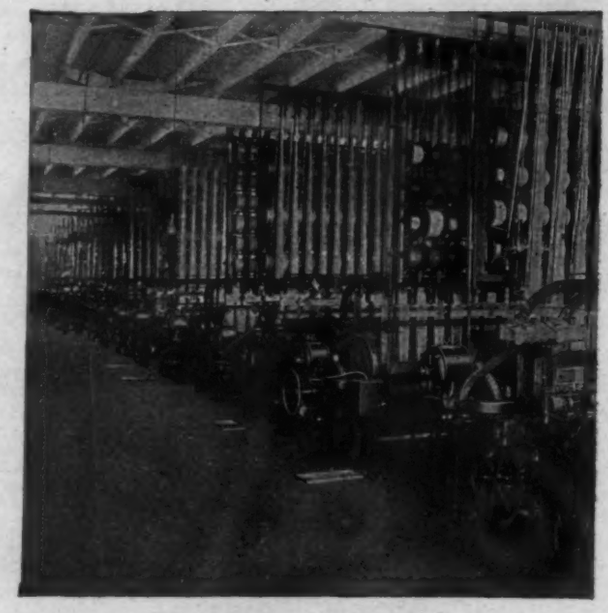


Fig. 1. View of Looms in New Mill Equipped With Ideal Induction Motors.

So pleased are the mill owners with the results obtained from motor drives that they have placed a second order to equip all the looms in their old plant with this type of induction motors. As soon as all of the looms are equipped, the steam plant is to be abandoned.

American cotton-cloth mills sold $1,984,536 worth of their products to the Philippines during the first nine months of 1910, against $385,544 in the same period of 1909. However, the sale of British cotton goods in the Philippines did not decrease, being $2,007,949 during the first nine months in 1910, against $1,945,225 in the 1909 period.

MILL NEWS.

Notices of mill projects, additions or improvements are solicited for this department.

Connecticut.

WILLIMANTIC. The Rossie Velvet Co., of Mystic, which will occupy the new industrial building here, has rented the factory on Valley street, formerly occupied by the Arger Dry Battery Co., and will use it as a training school for operatives previous to the opening of the new plant here.

Georgia.

ALBANY. The new mill of the Albany Cotton Mill, which has 10,752 spindles, is to be run on standard sheetings. The plant includes the main mill building, engine and boiler house, store house, office building, and a reservoir of 2½ million gallon capacity.

SAVANNAH. The Savannah Cotton Mills are to erect a fireproof warehouse 46x152 feet. It is rumored that the company is considering the enlargement of its plant during the coming summer.

LINDALE. H. P. Miekleham, agent of the Massachusetts Mills in Georgia, has issued a notice that this plant will run on full time for the year of 1911 excepting one week shutdown during the summer for vacation and repairs.

COLUMBUS. The overseers of the Columbus Mfg. Co. were treated to an oyster roast at the residence of the superintendent, M. E. Stevens, on the 11th of March. Oysters were served in various styles. The assembled guests were entertained by Prof. Pranze's orchestra until a late hour. The